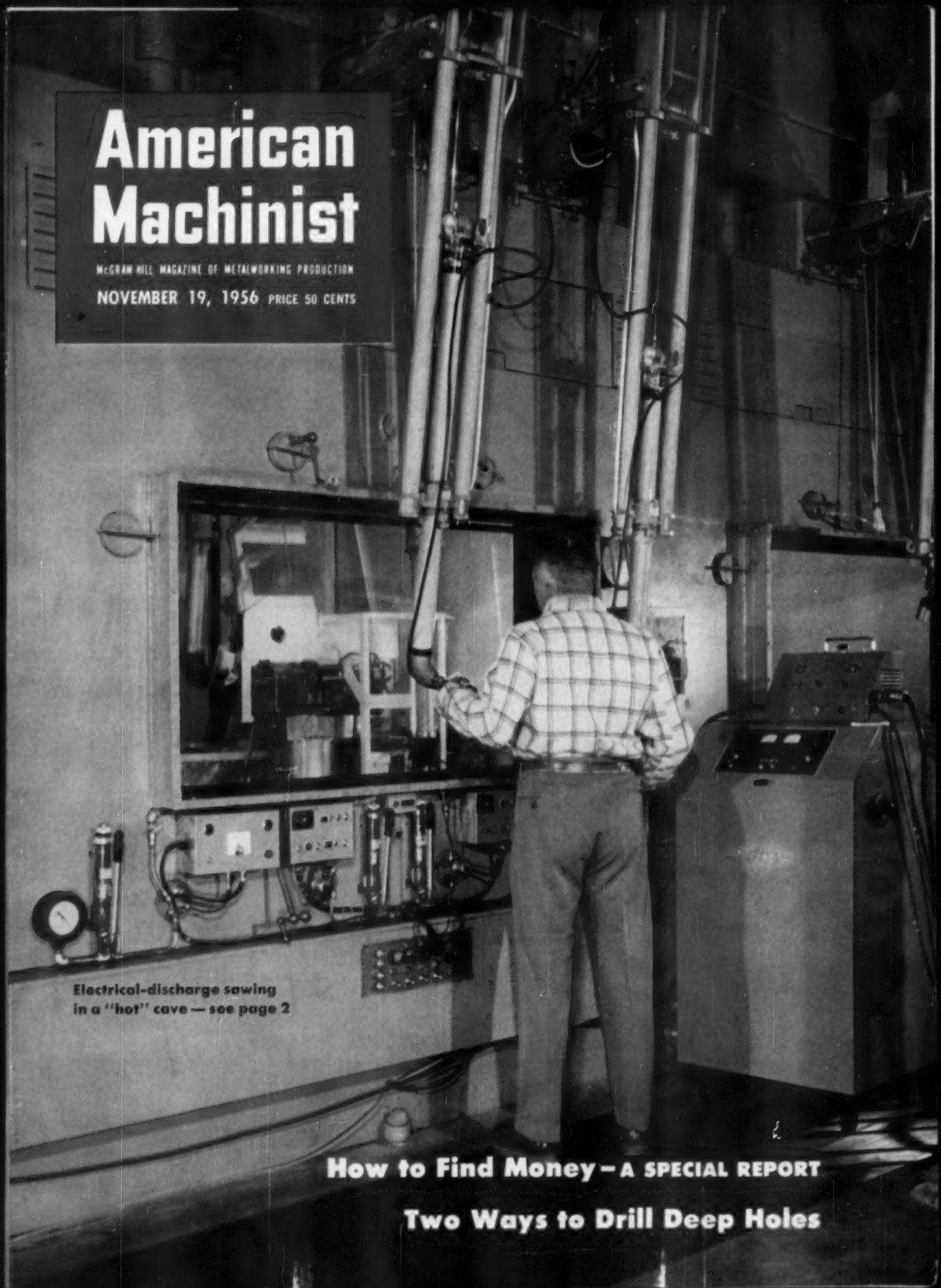
American Machinist

McGRAW HILL MAGAZINE OF METALWORKING PRODUCTION

NOVEMBER 19, 1956 PRICE 50 CENTS



Electrical-discharge sawing in a "hot" cave — see page 2

How to Find Money — A SPECIAL REPORT

Two Ways to Drill Deep Holes

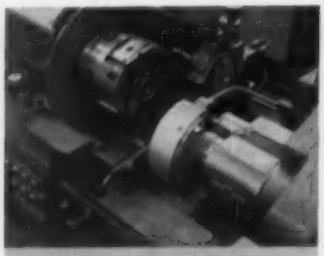
8 Ways to COMBINE

BORE and FACE GRINDING OPERATIONS

with Heald Multi-Spindle Internals

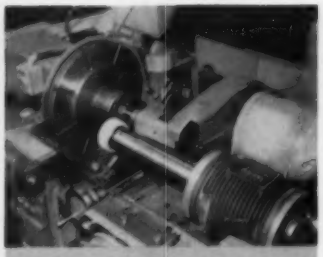
SIMULTANEOUS Bore and Face Grinding with SLIDE-BAR FACING

Bore grinding wheel reciprocates with table while facing wheel, mounted on anti-friction slide bars, is held forward against work under spring pressure. Face feeding stop controls depth of face grind.



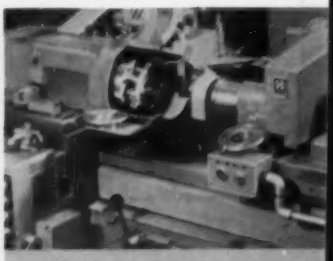
SEQUENTIAL Bore and Face Grinding with MANUAL FACING

Face is first plunged with manual facing attachment, while bore wheel enters bore without contacting work. Bore is then ground in Size-Matic cycle (facing wheel positioned to clear work on instroke).



SEQUENTIAL Bore and Face Grinding with RETRACTABLE FACING HEAD

With motorized facing wheelhead in extended position, face is plunge ground with manual feed (bore wheel is clear of work). Workhead is indexed forward and bore ground in Size-Matic cycle.

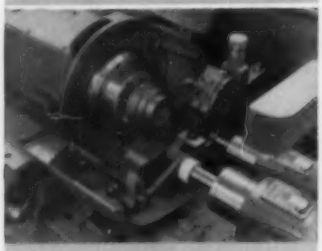


SIMULTANEOUS Bore and Bottom Face Grinding with SINGLE WHEELHEAD

Combined bore and facing wheel feeds against work while workhead feed is operating, grinding face to finish size and plunging bore to semi-finish size. Wheel plunges bore to finish size while held clear of face.

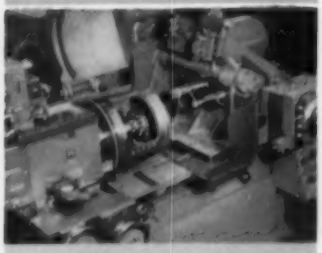
SEQUENTIAL Grinding of Two Bores and Bottom Face with SPACED WHEELHEADS

Small bore first ground to size (second wheel clears work), then workpiece is indexed forward in front of second wheel. Large bore is plunge ground and at same time wheel is fed forward to face grind bottom face.



SEQUENTIAL Bore and Bottom Face Grinding with SPACED WHEELHEADS

With workhead in rear position, bore is ground in Size-Matic cycle (facing wheel spaced to clear work). Work is then indexed forward and face is plunge ground to finish size, (bore wheel clears work).



SEQUENTIAL Plunge Grinding of STRAIGHT AND CONTOUR BORES

Two wheelheads first plunge grind large straight bore and spherical ball race. Work is then indexed forward and small combined straight and taper bores are plunged with shaped wheel.

SEQUENTIAL Grinding of I.D., O.D. and FACE with Spaced Wheelheads

Bore is first ground to finish size with workhead in rear position (face and O.D. wheels clear of work). Workhead indexes forward and bottom face and two O.D.'s are plunge ground with double wheel.

WHENEVER two or more grinding operations can be done at a single chucking, you convert handling time into *grinding time*. What's more, you get a more positive relationship between ground surfaces than could be obtained by any other method. Here are eight different Heald setups for performing such combined operations quickly and economically. For complete information, send for a copy of new Bulletin No. 2–69–2.

It PAYS to come to Heald!

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THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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How to find money for your business . . . A summary of sources for industrial financing in a tight money market, with comparisons of each and information on what you will need to get money from each source. *By William M Stocker, Jr, and Robert N Sheets.* 137

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American Machinist *Chips*

Cover . . .
An electrical-discharge saw cuts radioactive metal parts in a hot cave at Argonne National Laboratory. The yellow cast in the cave is caused by sodium-vapor lights. For an article on the sawing operation, see page 125.

Report on Russia . . . When Burnham Finney talked with A I Kostousov, minister of machine tools and small tools for the USSR, in London last summer, the minister invited us to make a personal study of Soviet metalworking. Acting on this invitation, we sent Norman Stubbs to Moscow in September. He was there for five weeks, is now back in London while Peter Trippe has gone to the USSR to continue our first-hand studies of Soviet machine tools and metalworking plants.

The first of a series of reports based on their on-the-spot observations begins on page 121. Using no second-hand material, these reports will form the first really complete, reliable picture of Soviet metalworking available. The first report covers the Ordzonikidze machine tool plant in Moscow and the machine tool palace there. It also gives some first impressions and background on the Sixth Five-Year Plan that will be useful in reading and understanding the series of reports that will follow. The USSR is embarked on an ambitious program and we urge you to read this series. It will give you a much broader understanding of the Soviet Union than either the many articles we have run on specific technical developments or the newspaper accounts—which include little information on Soviet industrial development.

Tight Money . . . Even if you haven't needed to borrow money for your business recently, you probably know that money for business loans is in short supply. We have all heard of companies that are in desperate shape for lack of cash for working capital or expansion.

A bank is a place, it has been said, that will be glad to lend you money if you can prove you don't need it. Inspired by this gag, and by the talk of the tightening money market, Bill Stocker and Bob Sheets started to look into the question of where you go when the bank turns you down. They soon amended this to include where you go *before* the bank turns you down. As they got deeper into the subject, and began to see the complexity of it, the need for a longer story became obvious. So Bill and Bob sold the idea of a Special Report on the subject of industrial financing.

They talked with bankers, brokers, businessmen, accountants, government officials, loan sharks, economists, and other experts. They have rounded up the opinions of these people and interpreted them for the non-financial reader in the report starting on page 137. If you need money for your business now, or think you ever will need it, you will find some helpful ideas. On top of that, you will find some help on two other questions. How much do you really need? What are you hoping to accomplish with the funds if you get them?

Why a Special Report on financing? Long-term readers of *American Machinist* are not likely to ask this question, for they expect us to cover all important questions in methods, materials, and management related to metalworking production. Whether the subject catches you by surprise or not, we think you will find it useful.

Coming . . . AM for Dec 3 will feature a group of articles summarizing production experience and recent studies comparing ceramic tools with carbides. Included will be reports from Ford, International Harvester, Monarch, Scully-Jones, and Sundstrand. Other articles will deal with machining of forgings, a plastic spacing gage, electroforming, and a practical approach to metal-cutting economics.

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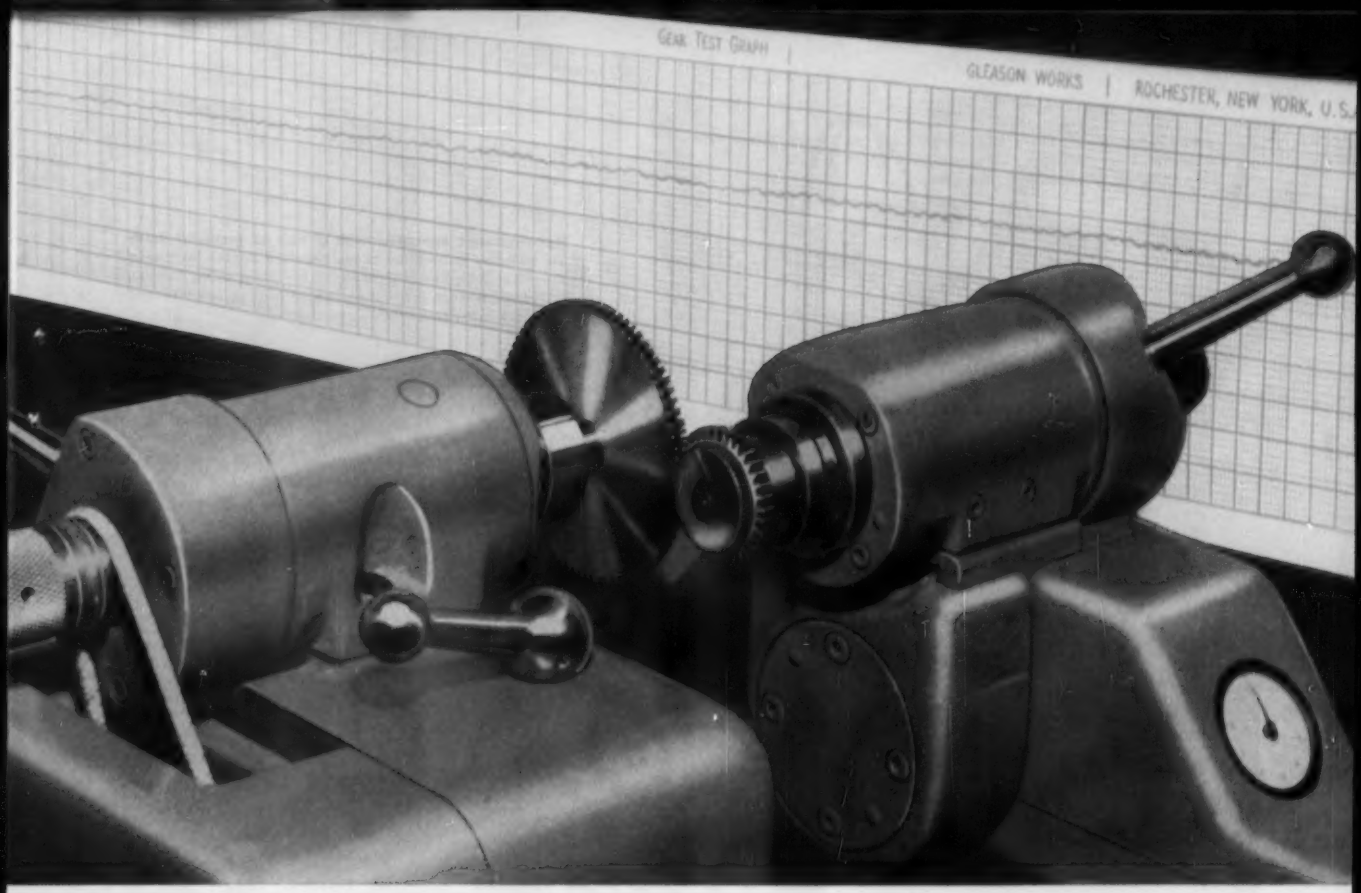


Make a complete test and record of your small spur and helical gears

You can be certain that your spur and helical gears will operate correctly in their final mountings if you give them a complete test *before* actual assembly.

The new Gleason No. 104 Spur Gear Tester gives you a complete check of your gears. A rolling test for composite error provides a quantitative check of tooth spacing, profile shape and runout.

In this test, the gears are slowly rotated while a calibrated spring load keeps them in metal-to-metal contact. Any error in the gears results in a horizontal movement of the drive spindle. A completely electronic pickup and recorder make a *permanent* chart of the results.

But there is still another test you can make with the No. 104 Tester—a running test, which simulates actual operating conditions, determines the smoothness of operation, noise characteristics, and tooth contact, which will actually be obtained when the gears are used.

This machine tests precision and commercial gears up to 4½" center distance.

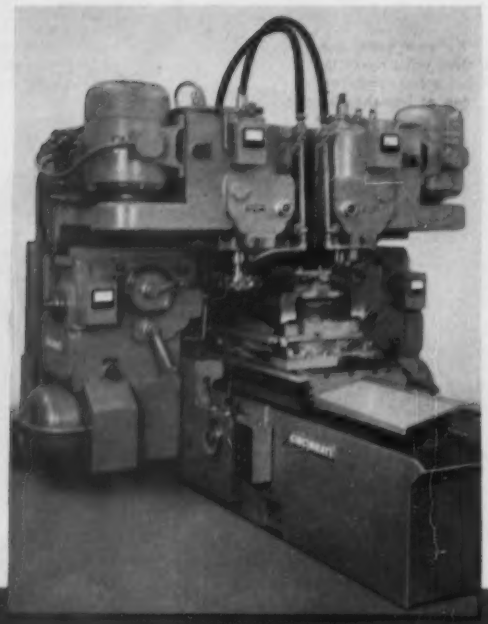
We will gladly furnish further information on the No. 104 Spur Gear Tester. Write for our bulletins.

The No. 104 Tester is furnished complete with an electronic pickup and recorder unit, as shown above.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.



HyPowermatic equipped with a pair of powerful vertical spindles in addition to the standard duplex horizontal spindles. Each has individual 20 hp motor drive. Tooling is for a low-cost production job of milling recesses and adjacent faces on various sizes of yokes.

HyPowermatic with 50 hp main drive and two vertical spindles in a fixed housing, tooled up to mill the top and combustion face on cylinder heads. Many standard HyPowermatic units and features are incorporated in this machine.

CINCINNATI

Easy on Your

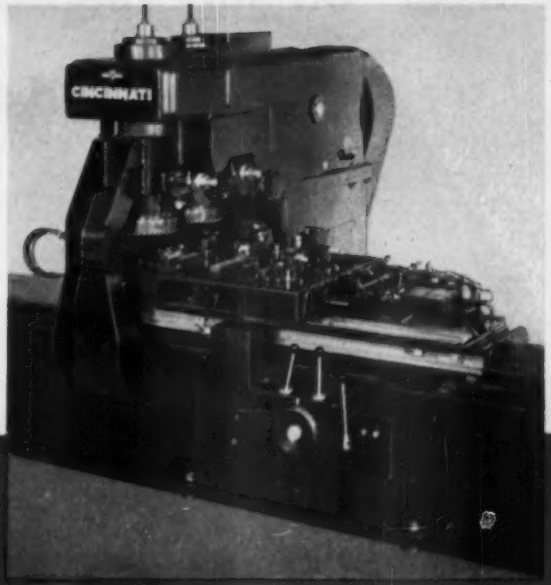
HyPowermatic with vertical spindle in fixed housing, tooled up to mill the motor mounting face and water outlet flange on crankcase covers. The spindle carrier has 8 speeds; 6" vertical adjustment of quill; automatic quill retraction.

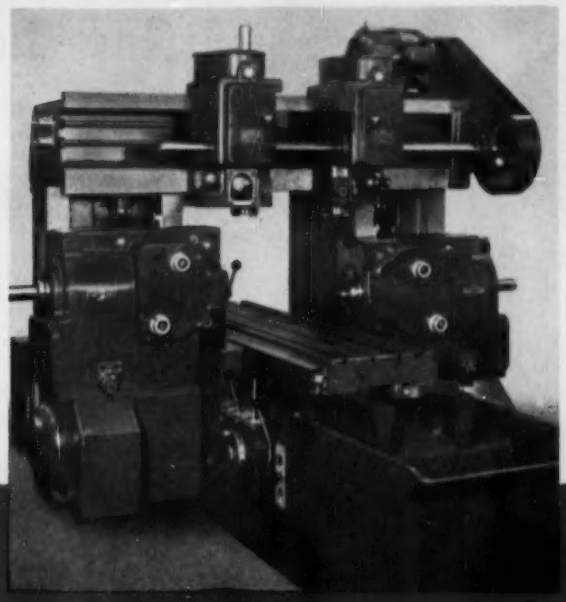
HyPowermatic, plain tracer controlled style. This is a standard model, for automatically milling profiles uphill and down, guided by a tracing roller contacting a template of the desired shape.

CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES

HyPowermatic, duplex style, equipped with highly useful complementary units consisting of two additional spindle heads mounted vertically on a cross rail. This HyPowermatic can mill simultaneously the sides and top of box-shaped parts.





Replacement Fund...

HyPowermatic Unit Construction Plan

Don't discard new production milling ideas without considering Cincinnati's HyPowermatic unit construction plan. You may find that a special machine is entirely unnecessary. HyPowermatics are assembled from standard and complementary units to give you unusual cost-reducing combinations such as:

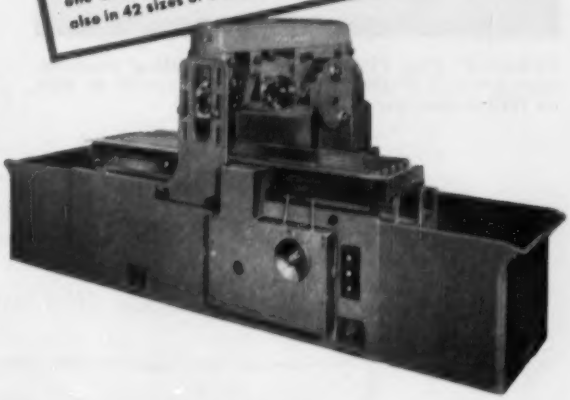
1) Close-coupled spindle carriers
2) Vertical and angular spindle heads; many styles and combinations, including adjustable angle
3) Ram mounted spindle heads
4) Fixed height or adjustable bridge type rail support for vertical spindle heads

Take a look at the heavy duty automatic milling machines in your shop which may have become productively obsolete. You may be surprised to see how much you can gain—in production and lower unit cost—by replacing with CINCINNATI® HyPowermatics, built up with standard and complementary units to suit the job. They offer many cost-cutting replacement possibilities. May we send you a copy of the new, fully illustrated catalog? For brief specs, look in Sweet's.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

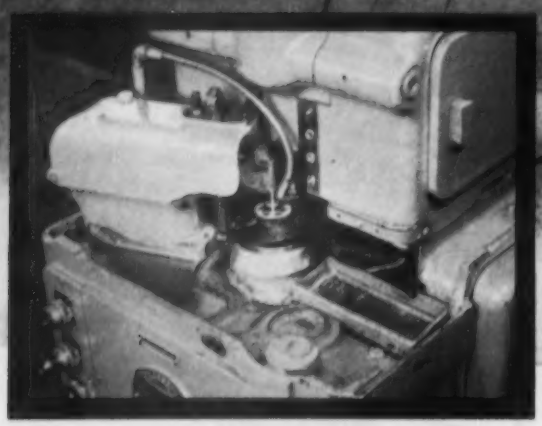
CINCINNATI Plain HyPowermatic MILLING MACHINE,

one of 42 sizes. Duplex and Tracer Controlled styles available, also in 42 sizes of each. All are outlined in catalog No. M-1909.

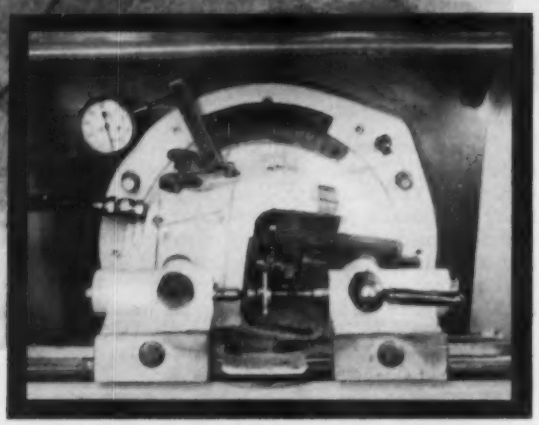


HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

"Putting the Finger" on supersonic demands



Fellows 3" Fine Pitch Gear Shaper cutting precision spur gears at Hughes Aircraft. Cutter speeds as high as 2000 strokes per minute are used.



Fellows No. 4 Fine-Pitch Gear Shaver finishes Hughes gears to tolerances as close as 0.0003" tooth-to-tooth composite error, 0.0005" total composite error.

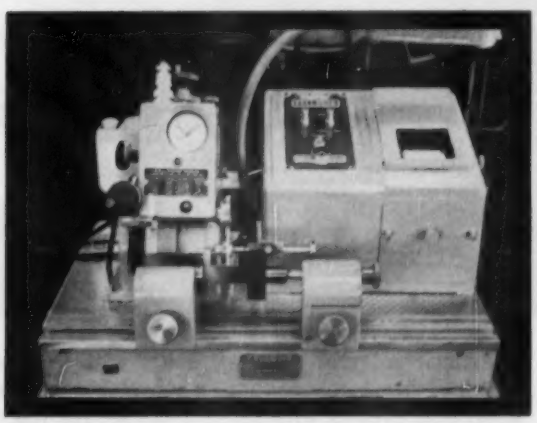
THE PRECISION LINE

targets

PRECISION GEARS...

Modern military aircraft travel two or more miles per *second*, missiles even faster! Control systems for detection and interception at such speeds must meet unprecedented demands for accuracy.

For their advanced armament control systems—the "electronic brains" of all types of Air Force interceptor airplanes, both American and Canadian, now guarding the North American continent from attack—as well as for use in the Falcon air-to-air guided missile, Hughes Aircraft Company manufactures up to 15,000 precision fine pitch gears per month. Tolerances are as close as 0.0005" total composite error, tooth-to-tooth composite error not in excess of 0.0003". Yet *standard* Fellows Gear Production and Inspection Equipment does the job.



Fellows No. 4 Fine Pitch Red Liner records tooth-to-tooth and total composite errors on permanent graph for Hughes production control.

In use at Hughes are Fellows 3" Fine Pitch Gear Shapers and Fellows No. 4 Gear Shavers for production. Inspection instruments are Fellows No. 4 Fine-Pitch Red Liner instruments and No. 12M Involute Measuring instruments.

To combine extreme accuracy with high production rates, look to the complete line of Fellows gear production equipment. Write, wire, or phone your Fellows Representative at any Fellows Office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
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Fellows *Gear Production Equipment*

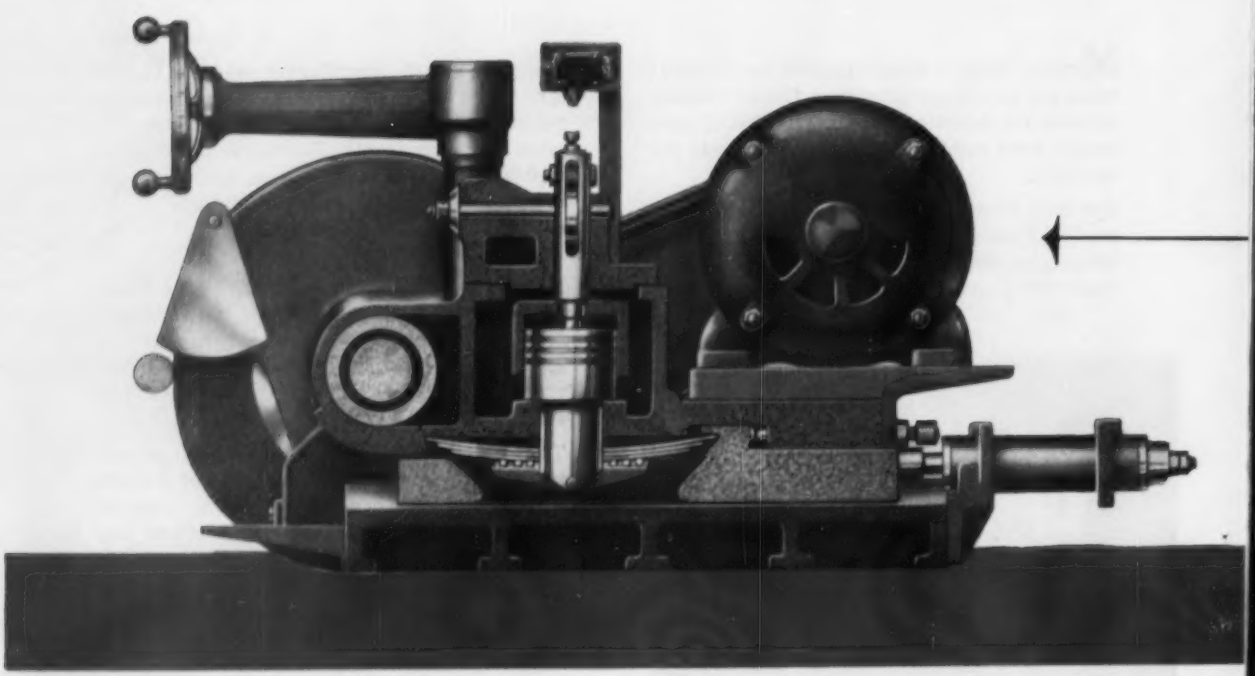
VAN NORMAN

Production Grinders

Featuring

The Exclusive "Bowgage" Wheelhead

That Cuts Cost of Mass Production Grinding Problems



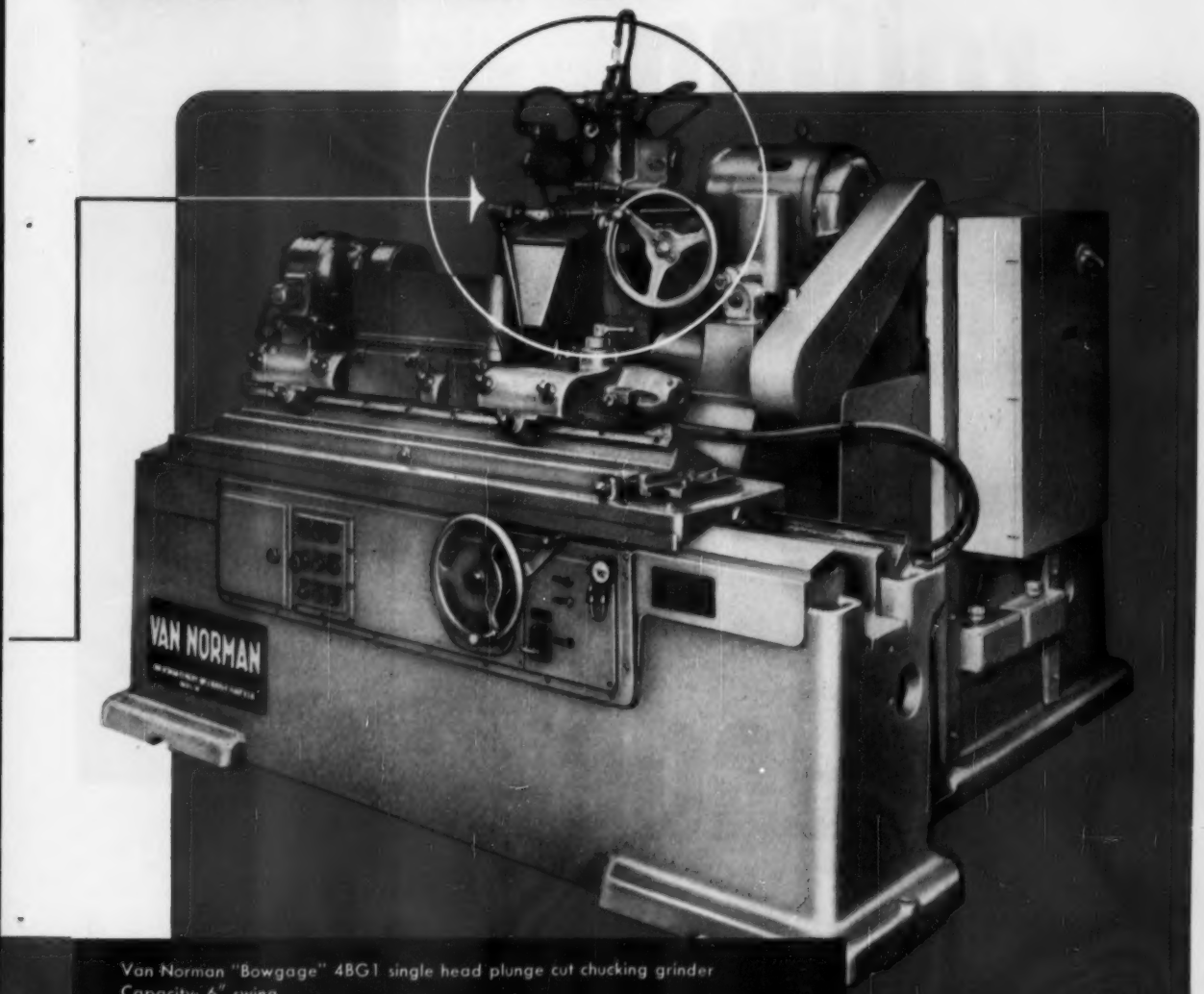
Van Norman Bowgage Production Grinders are designed and built to meet specific grinding applications. These "engineered-for-the-job" grinders cut tooling costs, enable you to produce more at the lowest cost-per-piece. By simply taking the exclusive Bowgage Wheelhead and mounting it on a massive rugged base, there is practically no limit to the number of diameters, tapers, shoulders, etc., that can be ground to close tolerances, automatically. These Bowgage Wheelheads are individual automatic integral grinding units, with feedback gauging, size compensation, diminishing feed and automatic cycling with rapid traverse. All the operator has to do is load the workpiece, push start button and the machine takes over performing all the operations, and then stops automatically for removal and reloading of the work.

Your mass production grinding problem is the Van Norman engineers' problem — let them help you solve it.

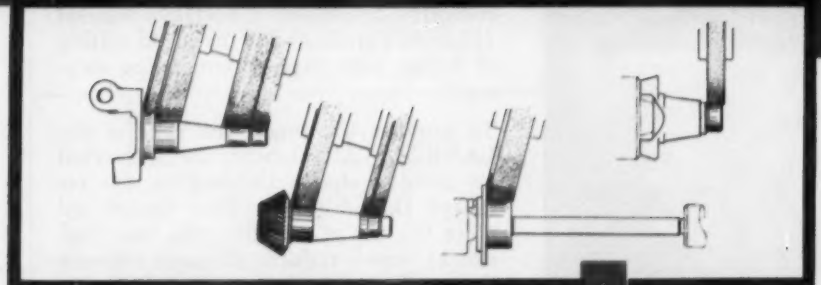
VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

No. 4BG1



Van Norman "Bowgage" 4BG1 single head plunge cut chucking grinder
Capacity: 6" swing
Grinding wheel: 30" x (¾ to 6) x (12 or 20). Grinding wheel motor: 10 to 20 H.P.



Don't wait . . . for extra profits install a Van Norman Machine now! They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years . . . See your dealer or write Van Norman Machine Company.

Conditional Sales Contracts not available to Export.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

rolling taper pipe threads

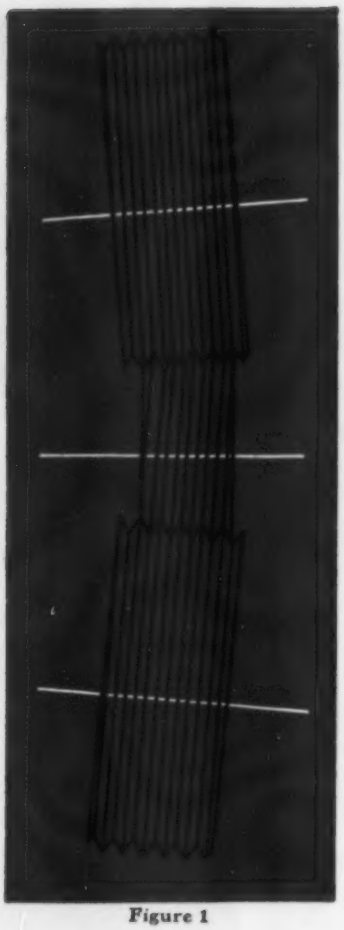
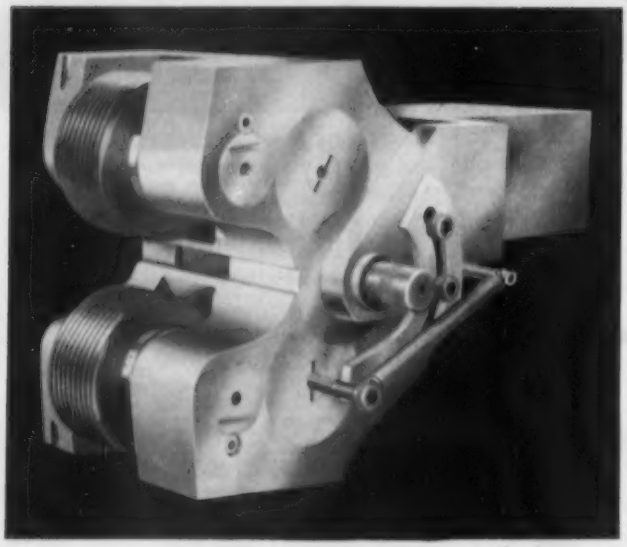


Figure 1

with the LANROLL thread rolling attachment



Thread-roll wear is minimized by the recently developed LANDIS Method (Patents Pending) for precision rolling of taper pipe threads (including dry-seal).

To produce the taper, the rolls of the LANROLL Attachment are supported on carbide shafts inclined to the required thread taper. This design enables the use of parallel rolls (see Figure 1) which reduces slippage between the workpiece and the rolls. With reduced slippage, roll life is materially increased. In addition, attachment stabilization (limited sidewise movement)

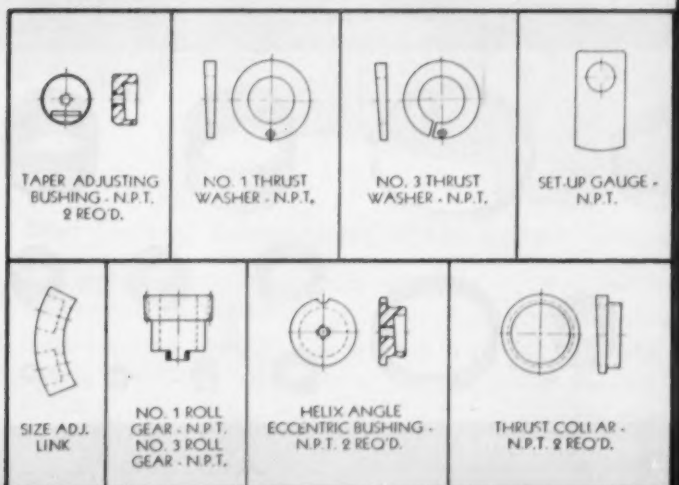
is greatly improved to permit rolling directly to a shoulder with safety.

Of an adjustable design, the LANROLL Attachments provide wide range coverage while retaining the rigidity of a non-adjustable tool. Either straight or tapered threads can now be produced with the same attachment through the use of proper rolls and auxiliary equipment. Five sizes with varying dimensions are available for use on the many sizes and makes of bar automatics, and will produce coarse pitch threads to Class 4 tolerances on all diameters from #5 to 1¾" for straight threads, and precision pipe threads from ⅛" to 1¼" in diameter.

In addition to proper rolls, the auxiliary equipment necessary to change from straight to taper threading is negligible, as illustrated in Figure 2. When changing from one pipe size to another within the range of the attachment, the size adjusting link, set-up gage and rolls are the only equipment changes required. With this design tooling flexibility is obtained with minimum cost. These changes assure operation of the attachment for every size within its range as though it were exclusively engineered for the particular work being threaded. Also, the same simplified and precise methods of set-up and roll timing used for straight threading are used for taper threading.

For additional information ask for Bulletin G-96 and specify straight or taper work.

Figure 2


TAPER ADJUSTING BUSHING - N.P.T. 2 REQ'D.
NO. 1 THRUST WASHER - N.P.T.
NO. 3 THRUST WASHER - N.P.T.
SET-UP GAUGE - N.P.T.
SIZE ADJ. LINK
NO. 1 ROLL GEAR - N.P.T. NO. 3 ROLL GEAR - N.P.T.
HELIX ANGLE ECCENTRIC BUSHING - N.P.T. 2 REQ'D.
THRUST COLLAR - N.P.T. 2 REQ'D.

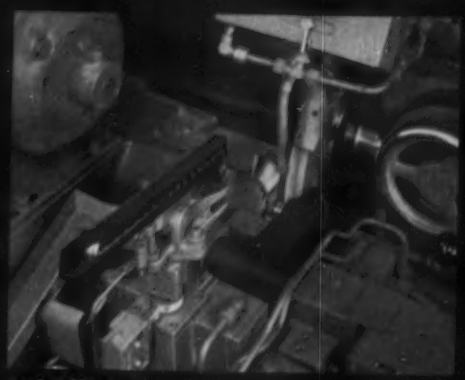
longer roll life with LANDIS parallel-roll method

LANDIS Machine COMPANY WAYNESBORO PENNSYLVANIA

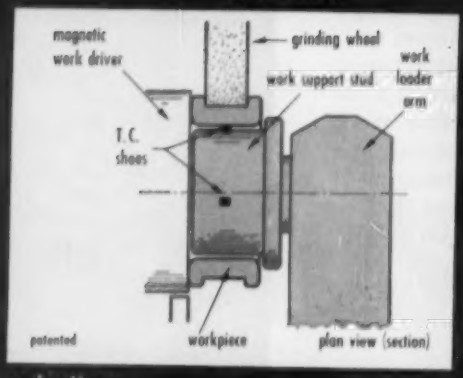
NEW automatic grinder for

Shoe-type centerless tooling

loading

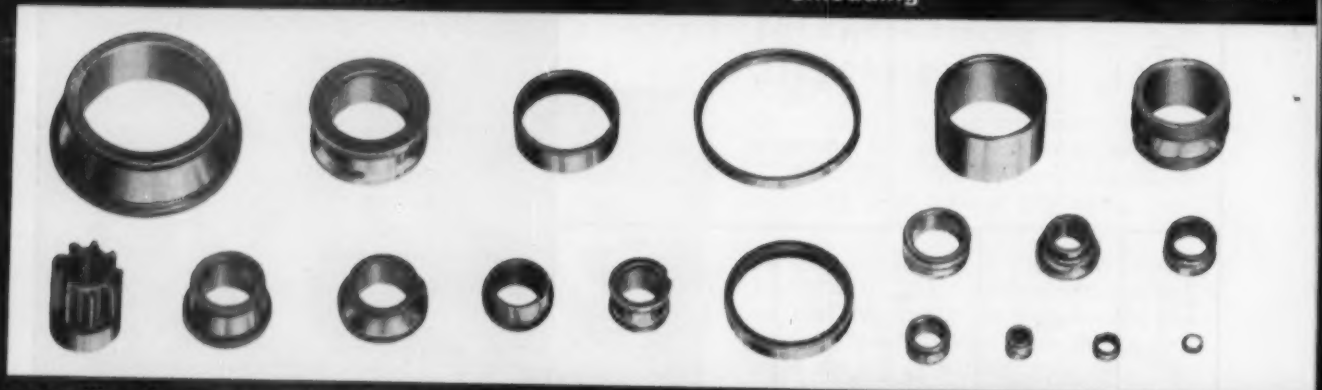


grinding



grinding

unloading



parts like these ground to precision limits—automatically

LANDIS TOOL COMPANY

large or small lot production

can be changed in less than one hour!

Landis 4" Automatic Concentric Grinder with work feeder and discharge chutes.

Cost-Cutting Advantages of the Landis Concentric Grinder

- Savings in set-up time make automatic operation for short runs economical.
- Super-precision results by elimination of work holding chucks, collets and arbors.
- Grinds straight or profiled workpieces.
- Automatic loading and feedback can be applied for continuous operation.
- Variable speeds and feeds for various sizes and materials.

WAYNESBORO, PENNSYLVANIA

LANDIS

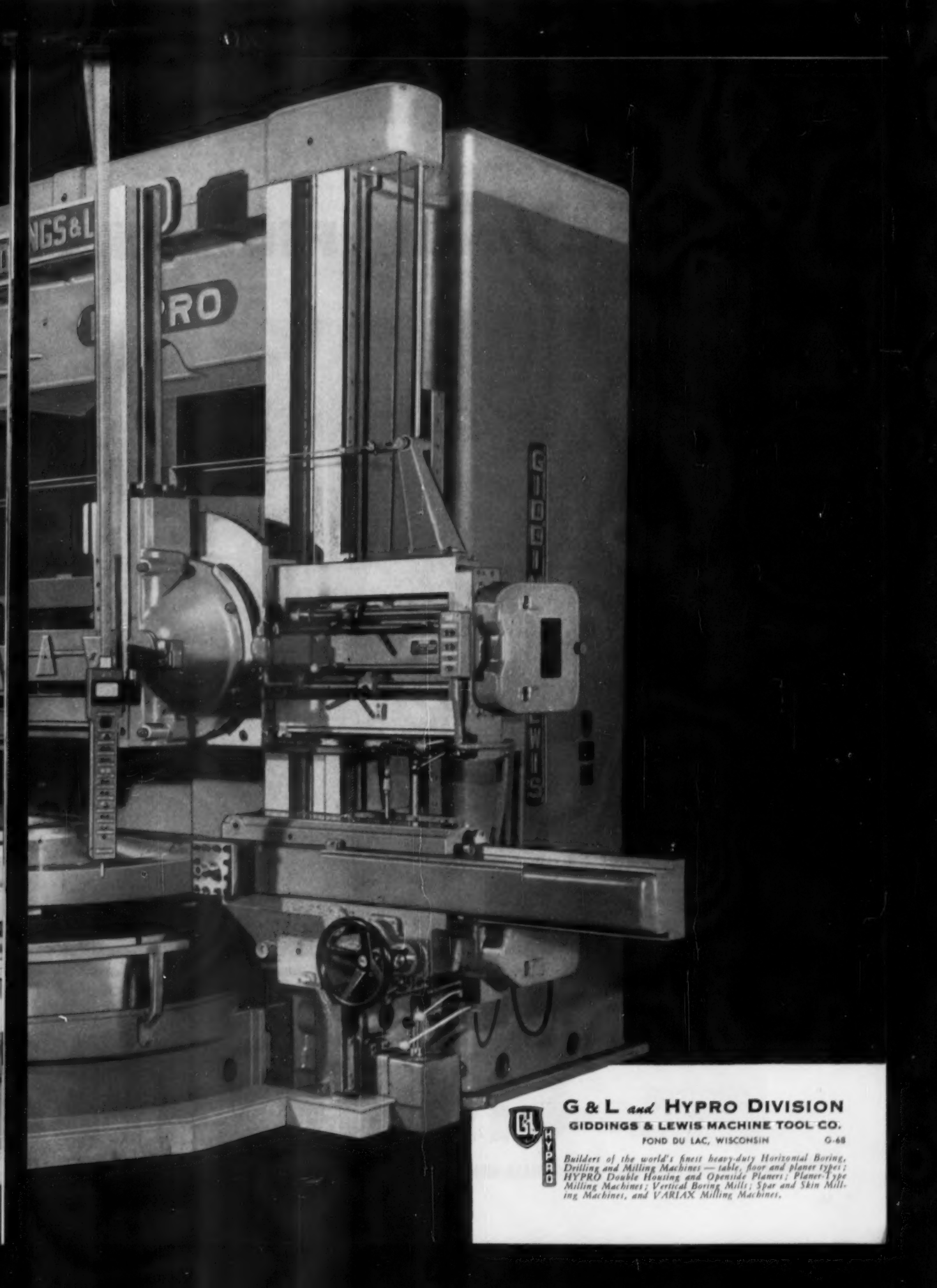
precision grinders

GIDDINGS & LEWIS
8-FT. VERTICAL
turning and boring mill

Today's production demands greater accuracy and speed in boring and turning operations. Pacing progressive machining methods is this HYPRO Vertical mill, equipped with optional tracer-controlled duplicating device — micrometer adjustment to stylus, remote speed control to adjustable voltage drive, constant controlled cutting speed and chip thickness.

HYPRO Vertical mills are available in 12 standard models with table diameters ranging from 54" to 12' and table work-load capacities up to 125-ton . . . motor drives up to 100 hp. For complete information, see your nearest G&L representative, or write direct.

LITERATURE AVAILABLE:
Write for complete descriptive Bulletin No. 54-12 on HYPRO Vertical boring and turning mills.



G & L *and* HYPRO DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN G-68

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

Cincinnati Filmatic

Highest quality of sizing and roundness is obtained at low cost by grinding these anti-friction bearing rings on a CINCINNATI FILMATIC No. 4 Centerless Grinder equipped with Power Race Grinding Fixture.

(Photo courtesy of McGill Manufacturing Company, Inc., Valparaise, Indiana)

CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

Nos. 0 2 3 **4** 5 6 Centerless

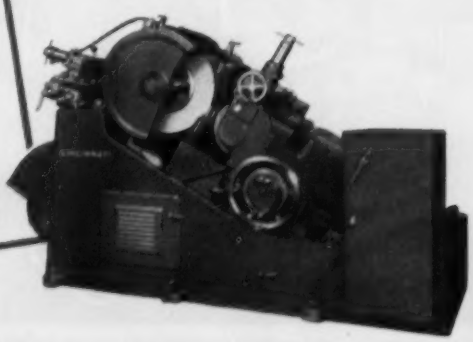
The No. 4 is the machine for this job . . . grinding thin wall rings to perfect roundness

FILMATIC

Thin wall rings are extra sensitive to OD grinding pressure . . . the lower it is, the better for accuracy. A prominent manufacturer of precision anti-friction bearings is well acquainted with this factor in production work, and keeps it under control by grinding large diameter rings on a CINCINNATI® FILMATIC No. 4 Centerless. And there's a good reason for choosing the No. 4. The bed is inclined at a 30° angle, resulting in an increased driving effort by the regulating wheel. Even with no grinding wheel contact, the work rotates with the regulating wheel. ¶ Other advantages of CINCINNATI FILMATIC No. 4 Centerless Grinders include: self-adjusting grinding wheel spindle bearings (they're FILMATIC, of course) . . . hydraulic grinding wheel truing . . . independent 400 rpm truing speed for regulating wheel . . . no collets required for regulating wheel . . . 30 hp main drive. ¶ Only Cincinnati can offer a choice of six sizes of fine centerless grinding machines. You will find brief specifications for all of them in Sweet's Machine Tool Catalog File.

CINCINNATI GRINDERS INCORPORATED CINCINNATI 9, OHIO

CINCINNATI FILMATIC No. 4 CENTERLESS GRINDING MACHINE



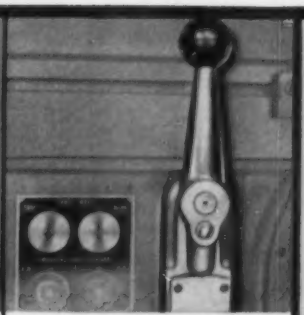
GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Profits in easy reach...

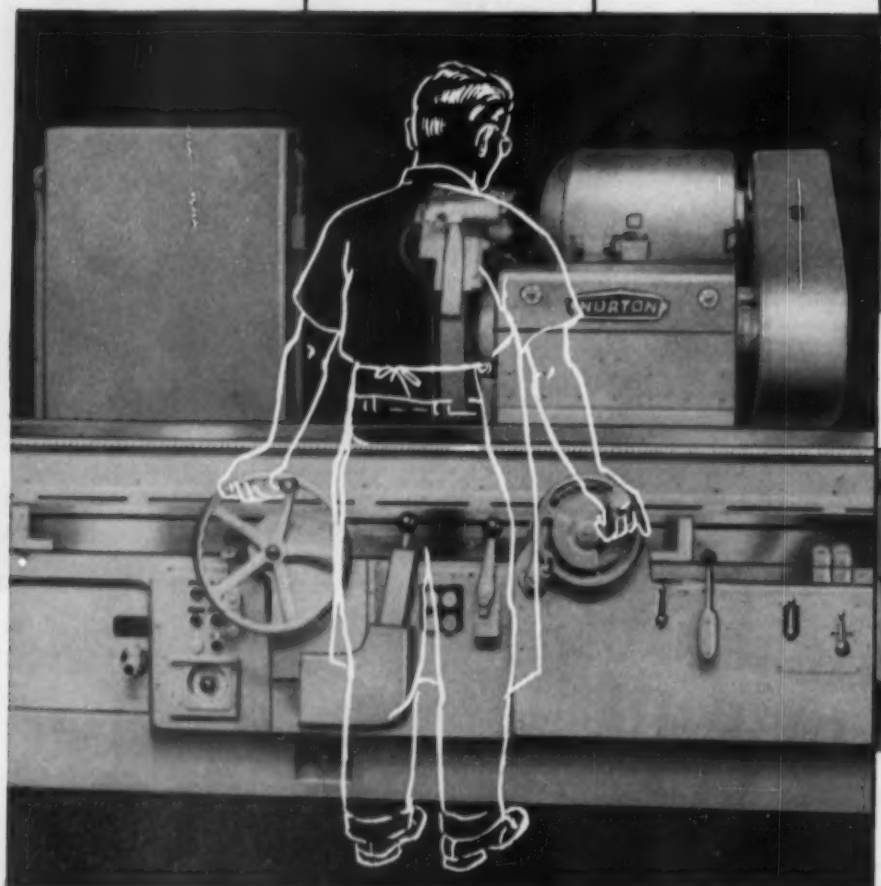
Flip this switch to set work rotation and coolant flow for manual operation or automatic operation with the cycle.

Use this lever to jog work rotation for roundness inspection or unloading.

Turn these knobs to set separate dwell controls for each end of table travel.

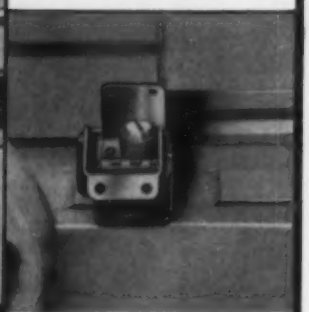


Use this lever to select preset table-truing or grinding speed — eliminating need for continual re-settings.



All controls for feeds and speeds within easy reach.

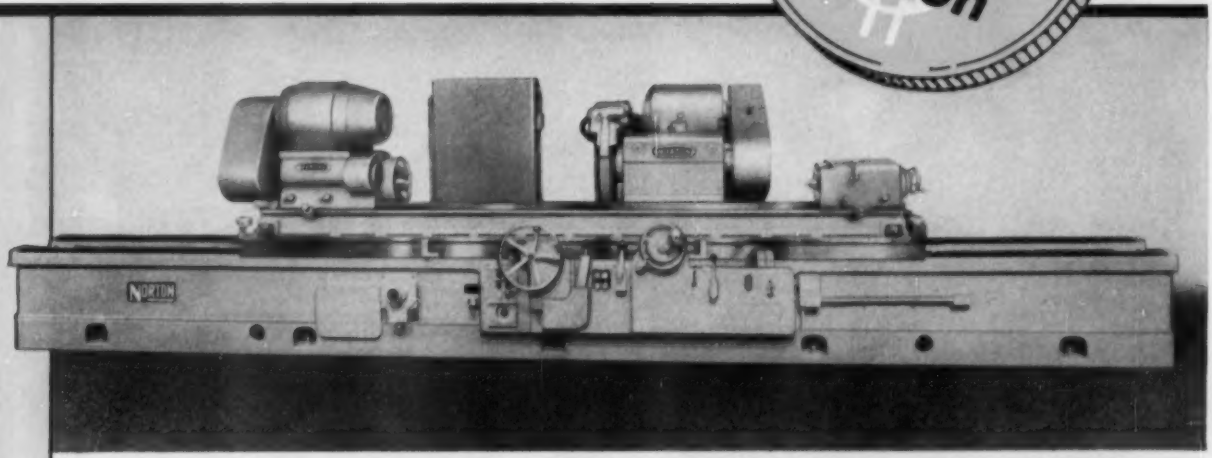
Count the indexing clicks on this wheel-feed handwheel for work diameter reduction in increments as fine as .0001".



Use this simple control for adjusting automatic feed from zero to .003". Total automatic feed is .150" on diameter, with automatic reset after grinding to size.

with two new advanced design Norton Cylindrical Grinders

Cut waste motion



The Norton 14" x 96" Type C-2 Semiautomatic Cylindrical Grinder — one of two sizes of new cylindrical grinders just announced by Norton.

The other is the 18" Type LC-2. Work length capacities of 36", 48", 72", 96", 120", 144" and 168" are available.

Feed and Speed Adjustments all on front of 14" Type C-2 and 18" Type LC-2 Grinders . . . Key Maintenance Points Easily Accessible

Features on these two new Norton cylindrical grinders mean more profit because they eliminate waste motion.

Operators of the 14" Type C-2 and 18" Type LC-2 need never leave their normal positions to make changes in settings. Controls are all at their fingertips.

All equipment needing occasional inspection is in easy reach. Electrical controls are grouped in an elevated enclosure. Motors, pumps, filters, pressure relief valves, and ways lubricant valves are all mounted on the outside for inspection or service.

The machines incorporate the proved Norton wheel spindle design, positively controlled micrometer-fine wheel feed design and generous, rugged overall construction to insure highest productive capacity and unsurpassed sizing control. They assure lowest costs in producing highest quality parts.

These features and many more give you the "Touch of Gold", by making your grinding more profitable. And only Norton can bring you the long experience with both grinding machines and wheels that is engineered into these advanced machines.

Ask Your Norton Representative

for more facts about the new 14" Type C-2 and the 18" Type LC-2 cylindrical grinders. Or write direct to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize with NEW

NORTON

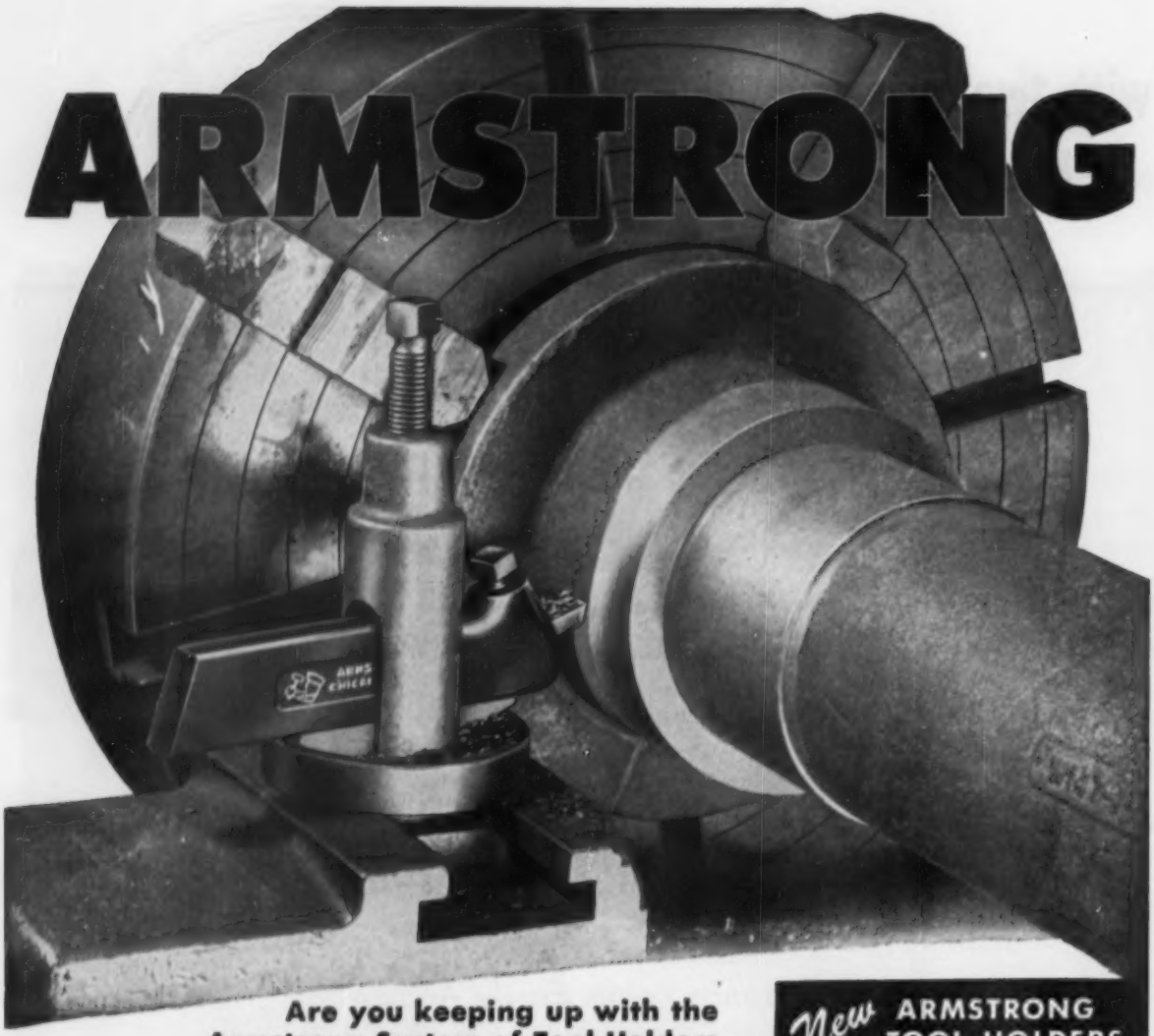
GRINDERS and LAPPERS

Making better products . . . to make your products better

Norton Products: Abrasives • Grinding Wheels • Grinding Machines • Refractories
Behr-Manning Products: Coated Abrasives • Sharpening Stones • Behr-cat Tapes

District Offices:
Worcester • Hartford • Cleveland • Chicago • Detroit

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

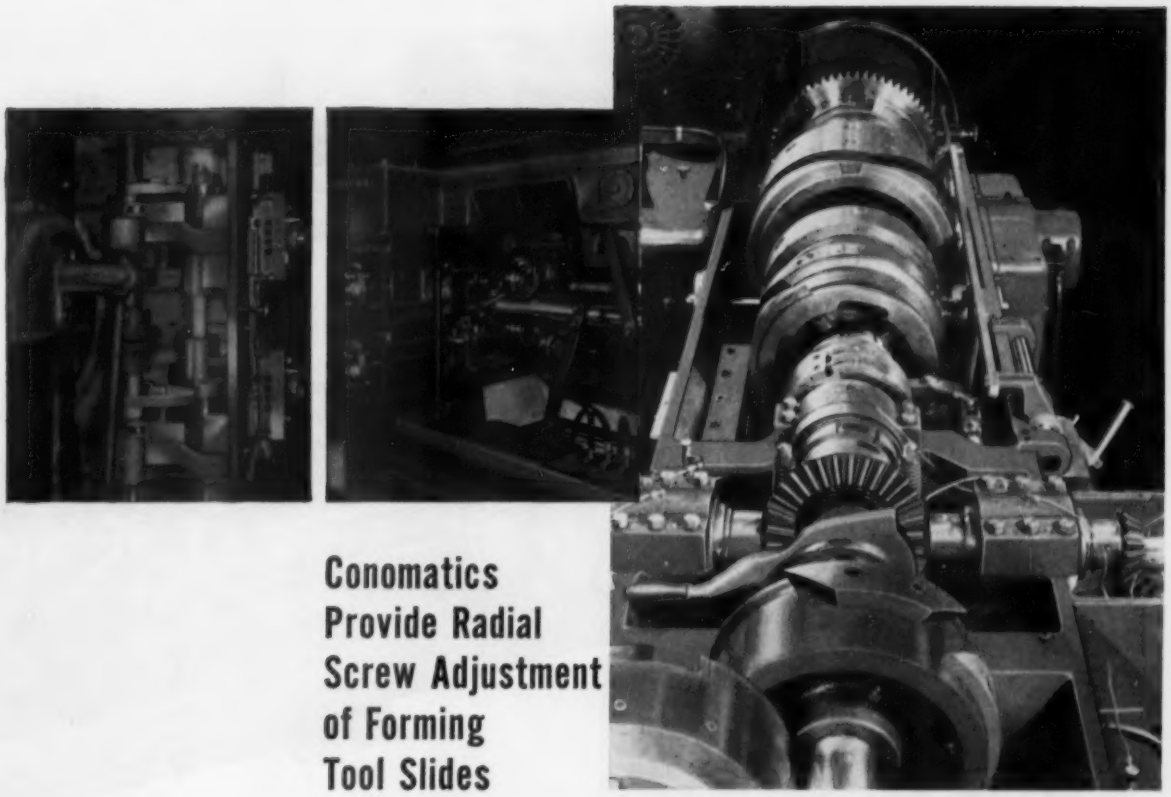
With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

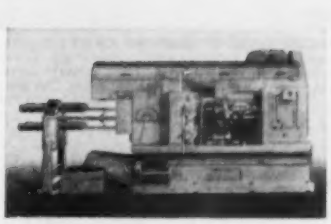


Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

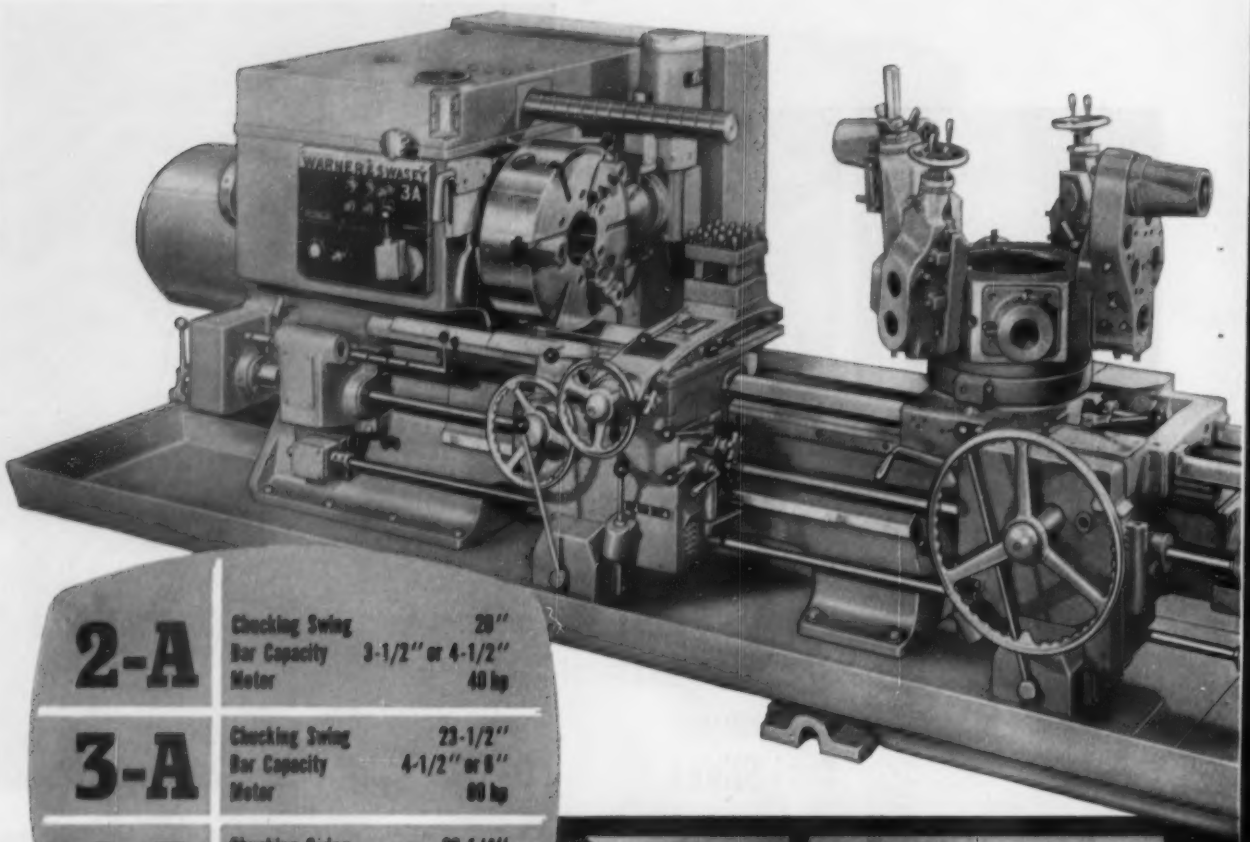
Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes. Write, wire, or phone for literature.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



2-A	Chucking Swing	20"
	Bar Capacity	3-1/2" or 4-1/2"
	Motor	40 hp
3-A	Chucking Swing	23-1/2"
	Bar Capacity	4-1/2" or 6"
	Motor	60 hp
4-A	Chucking Swing	28-1/4"
	Bar Capacity	8" or 12"
	Motor	75 hp

MORE POWER—as much as you'll need for any job! Motors available up to 40 hp. on 2-A; to 60 hp. on 3-A; to 75 hp. on 4-A.

NEW HYDRAULIC CHUCK AND BAR FEED and power return. Provides easier handling, less operator fatigue—increased production.

MAINTENANCE-FREE, instant-acting forward and reverse clutch and head-brake unit never needs adjustment—engages smoothly and virtually instantaneously providing fast starts, stops, and reverses.

INDUCTION-HARDENED VEE-BEDWAYS assure long, accurate life. Exclusive way covers protect bearing surfaces from damage by dropped tools, chips, and loss of way lubrication.

ACCURATE LOCATING AND LOCKING HEX TURRET assures maintained accuracy. Single lever controls both locating and clamping of turret.

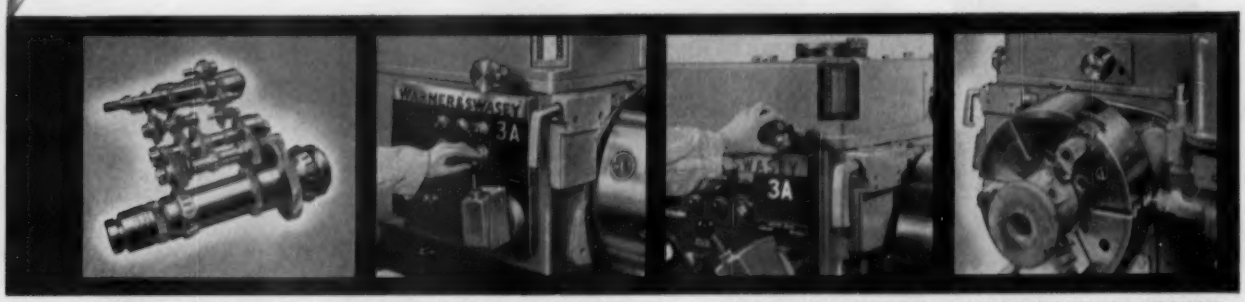
FAST OPERATING CROSS SLIDE. All controls within easy reach. 4-way traversing with rapid traverse lever. Monoshift lever provides fast feed changes. Open-type square turret for flexible tooling.

WARNER & SWASEY DESIGN FEATURES

give you increased efficiency,

greater production, more profits!

A 1-A model, with motors ranging to 30 hp., is available with an instantaneous shift, all-clutch headstock. It's provided with a 16¼" swing in either 2½ or 3-inch bar capacities.



16-SPEED DRIVE provides closer grouping of speeds in natural work range to turn more work diameters more effectively—increases production and tool life. 2-speed motor provides 32 *unduplicated* speeds!

SPEED PRESELECTION made easy by large, direct-reading indicator dial. AUTOMATIC GEAR SHIFTING boosts production, reduces operator fatigue. A single movement of the control handle without any further attention by the operator slows spindle to crawl speed, then shifts to new speed—all in a matter of seconds.

NEW POWER CHUCK WRENCH eliminates back-breaking effort when chucking. Grips and holds delicate work or heavy forgings. Does not obstruct spindle bore.

INCREASED STRENGTH WITHOUT INCREASED WEIGHT. Scientific diagonal-rib design gives over 30% added strength—greater rigidity and long-term accuracy.

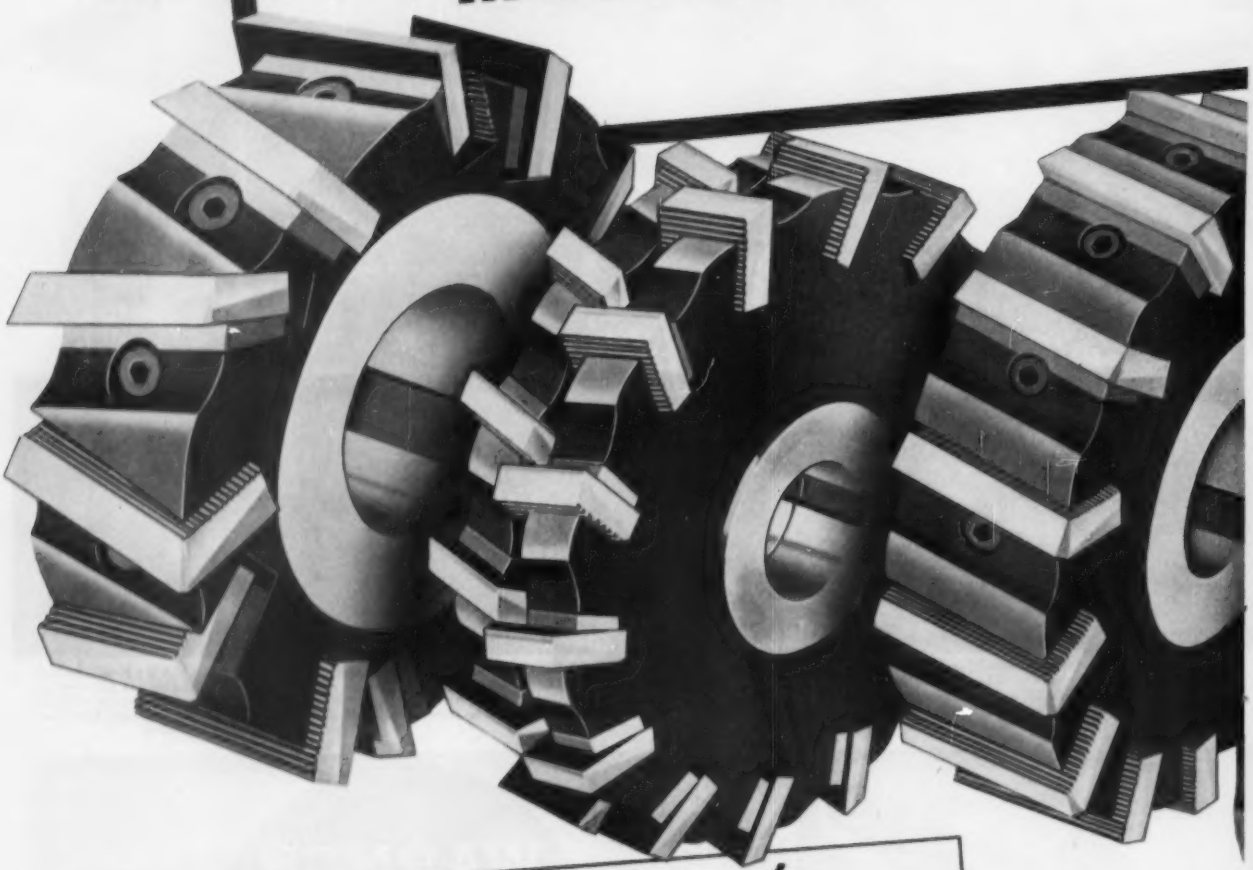
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

... and AGAIN

MORSE

MOVES AHEAD...



Another reason why

MORSE

means

"THE MOST"

in Cutting Tools

with a Complete Line of

Inserted Blade CUTTERS

This new Morse line is complete . . . every standard type and size, plus any special up to 36"! And this new line makes the Morse-Franchised Distributor *more than ever* "the man with the most" in cutting tools.

MORSE TWIST DRILL & MACHINE COMPANY · NEW BEDFORD, MASS.

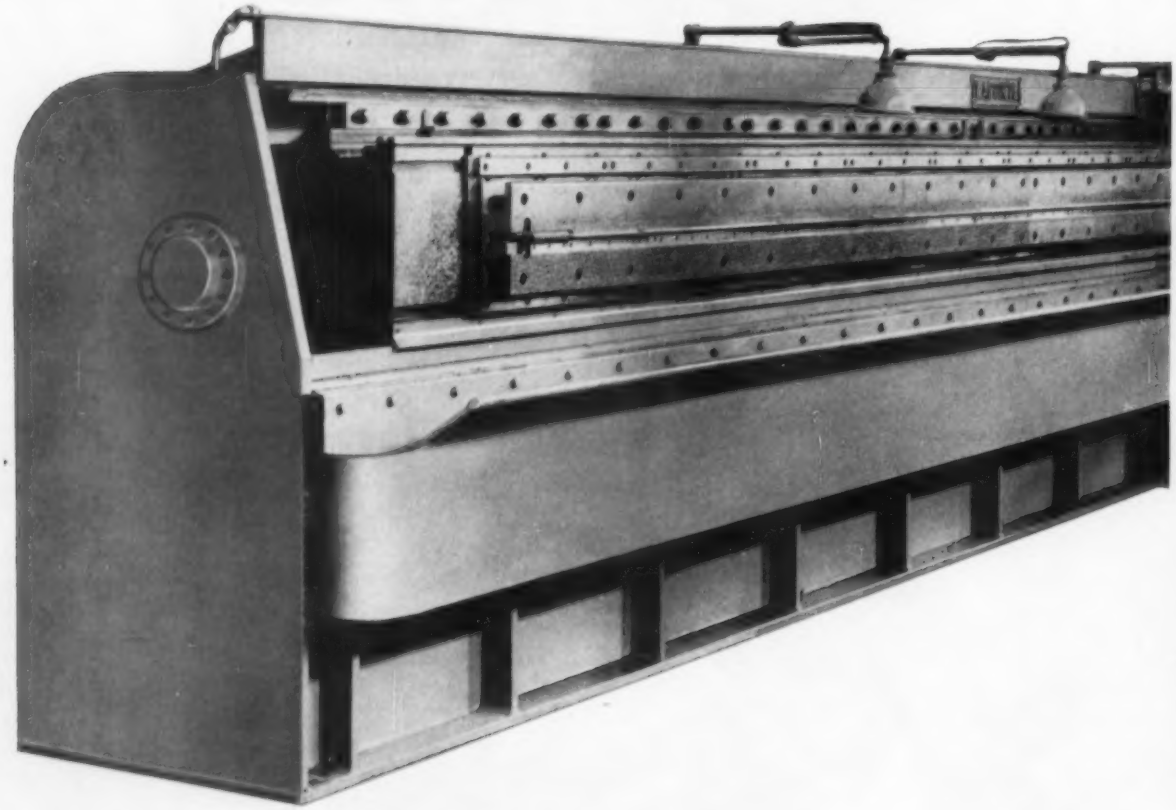
Subsidiary of VAN NORMAN INDUSTRIES, INC.

Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

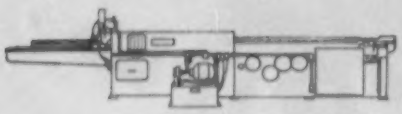
World's largest broaching machine!

the new LAPOINTE ELECTRO-MECHANICAL® BROACH

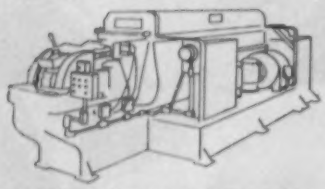
built with 240-inch stroke!



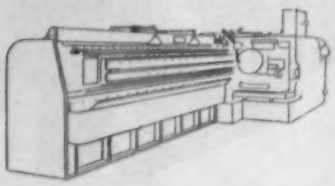
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



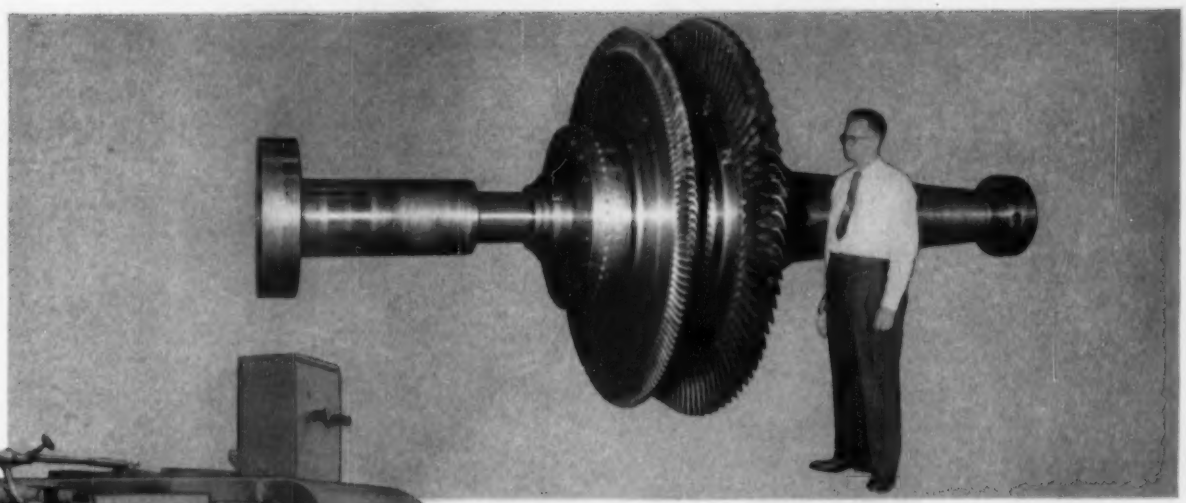
60" STROKE HORIZONTAL, ELECTRIC

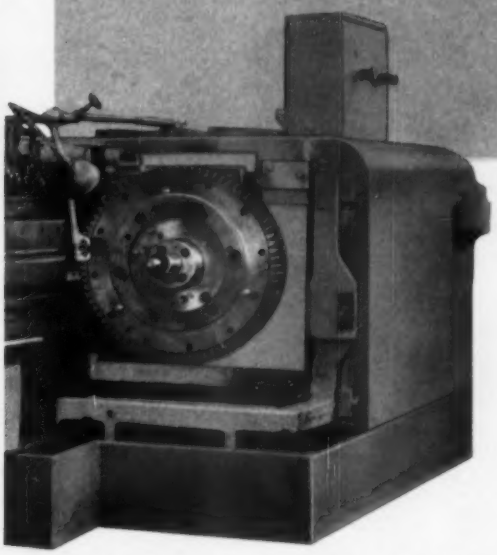


CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC





Designed for broaching the "pine tree" form on wheels for a stationary gas turbine, this machine can accommodate turbine wheels up to 80-inch diameter, 9-inch rim thickness! Such heavy broaching is easy for this machine, which is built with the powerful continuous tooth herringbone type bull gear and rack.

BROACHING TAKES A GIANT STEP

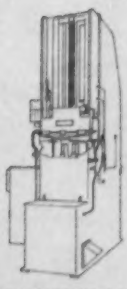
Broaching has entered the leviathan stage! It joins the family of really big machines — the giant grinders, the mammoth millers, the prodigious presses and planers.

To Lapointe goes the credit for engineering and building this biggest of all broaches, for Lapointe was known to have the facilities and the know-how to do the job. And with all its size, this broach will of course hold the extreme tolerances required for indexing and broaching the intricate "pine tree" form on gas turbine wheels.

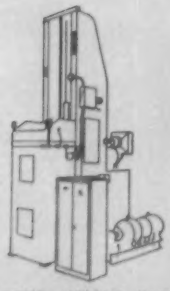
This latest accomplishment is another indication of Lapointe's ability to anticipate the demands of industry. Lapointe — with 54 years of broach-building experience — has always led the field in developing broaching machines, broaching fixtures, and broaches. "When BIGGER and BETTER broaching machines are built, LAPOINTE will build 'em!"

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS • U.S.A. In England: Watford, Hertfordshire

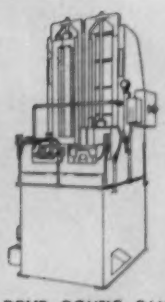
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



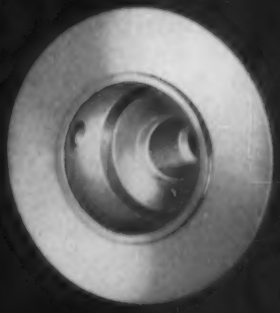
DRVE DOUBLE RAM VERTICAL, ELECTRIC

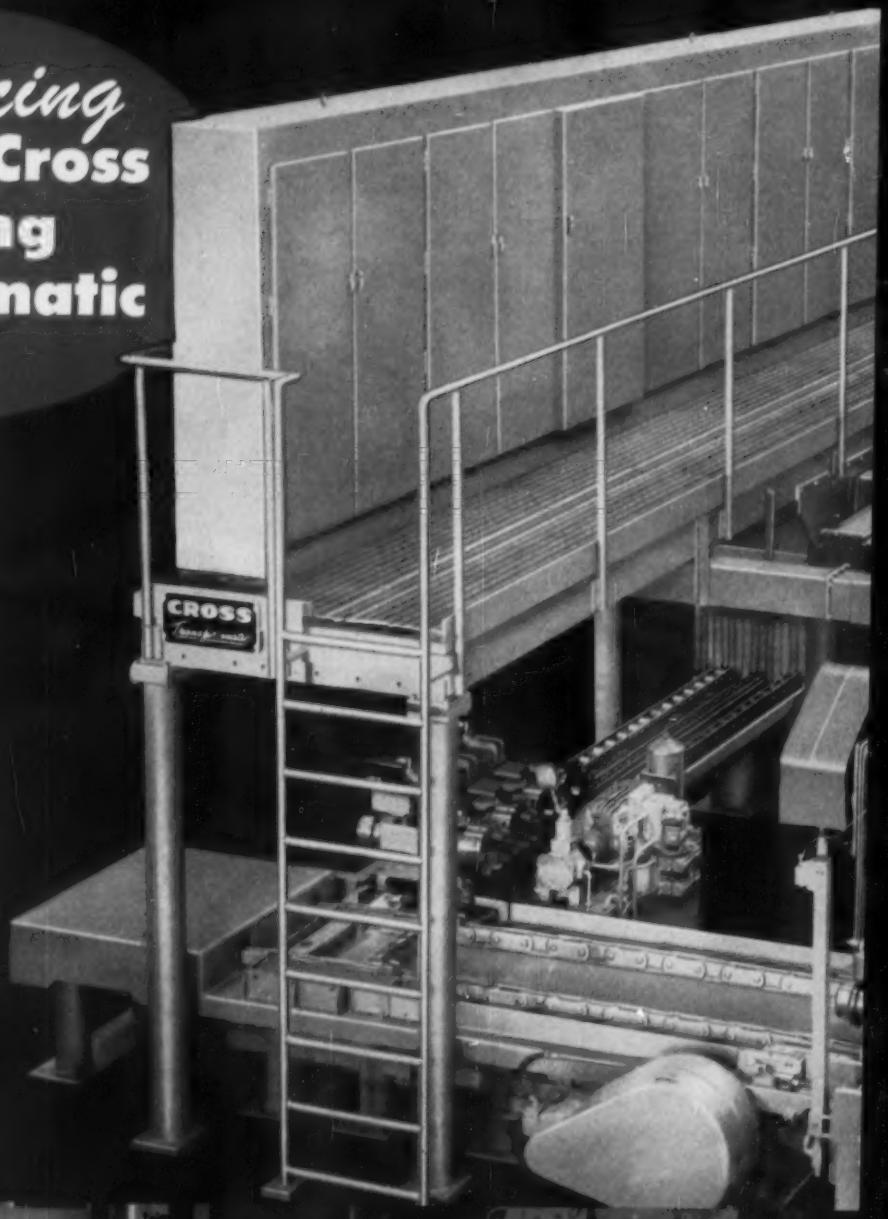
LAPOINTE
known to be the best in
BROACHING

Announcing

the NEW Cross Chucking Transfer-matic

Pat. No. 2743167

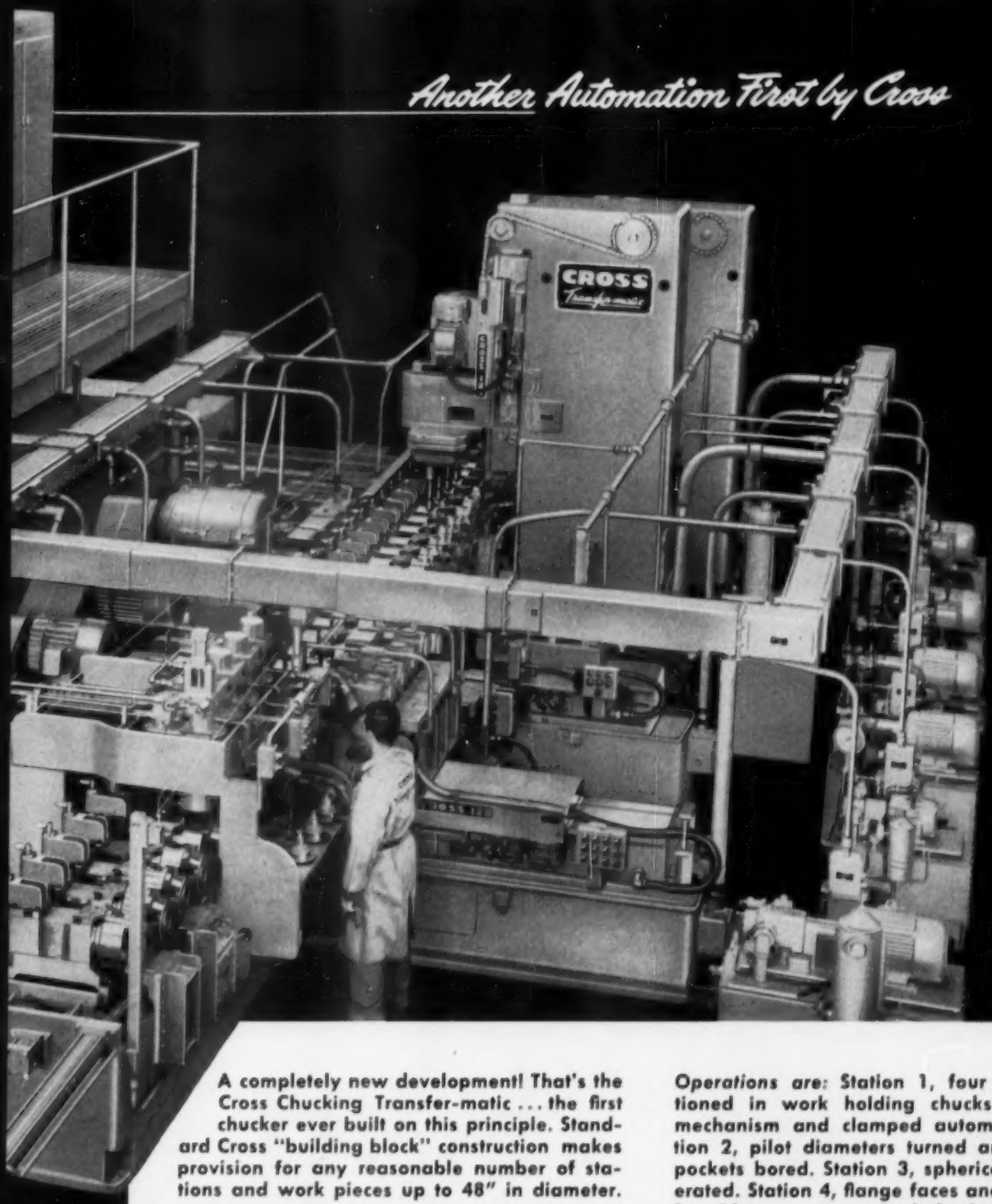




Station 1

Station 4

Another Automation First by Cross



A completely new development! That's the Cross Chucking Transfer-matic . . . the first chucker ever built on this principle. Standard Cross "building block" construction makes provision for any reasonable number of stations and work pieces up to 48" in diameter.

This particular seven station Transfer-Matic, created for differential gear cases, has a rated capacity of 368 pieces per hour at 100% efficiency.

An unusual feature is that the work pieces are chucked and not released until all operations are complete. The chucks are mounted on precision spindles, which in turn are carried on pallets—four to the pallet. There are ten pallets—one at each station and three on the conveyor moving from Station 7 to Station 1.

Operations are: Station 1, four pieces positioned in work holding chucks by loading mechanism and clamped automatically. Station 2, pilot diameters turned and side gear pockets bored. Station 3, spherical seats generated. Station 4, flange faces and thrust faces for side gears generated. Station 5, pin hole for pinion shaft drilled after spindles are indexed into pre-determined position and locked to prevent rotation. Station 6, pin hole chamfered top and bottom. Station 7, pin hole rough and finish reamed with shuttle head.

Features include construction to JIC Standards, hardened and ground ways, interchangeability of all parts, pre-set tooling and programmed tool changes with the Cross Machine Control Unit.

Established 1898

THE **CROSS** CO.

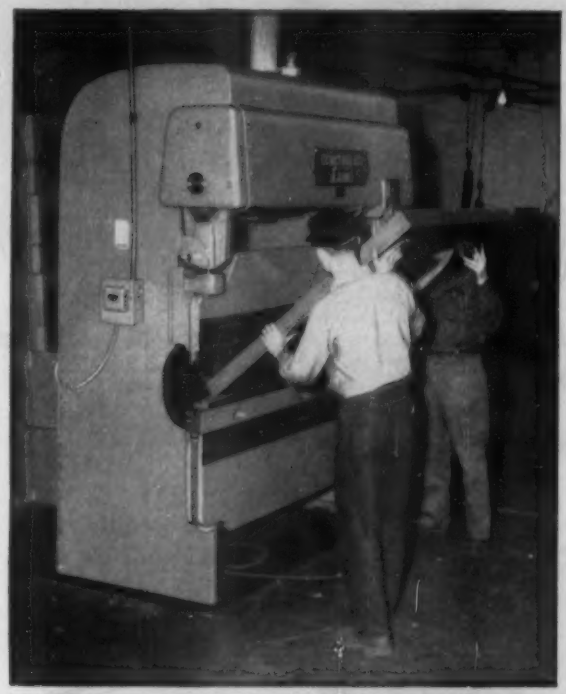
First in Automation

DETROIT 7, MICHIGAN

This accurate Cincinnati

Fan casings.

Press Brake saves money and time...



Photos courtesy of Anchor Metal Spinning Company.

at ANCHOR METAL SPINNING CO.
Dayton, Ohio

Profitable production has been achieved by installing this Cincinnati Press Brake.

Accurate flanging of fan housings is done rapidly while meeting the rigid requirements for squareness. Operations on different sizes and gauges of materials are performed with ease. Parts for assembly are ready on time and smooth shop operation maintained.

Write for Bulletin "2 New Cincinnati Press Brakes" for complete information on these versatile machines.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

NEW!

ROTOR AIR SCREW DRIVERS AND NUT SETTERS

Powerful! Light!

Rugged . . . long-life construction

More power per pound

Simplified torque adjustment

3 types of drives

Reversible or non-reversible motors

TYPICAL SPECIFICATIONS
Reversible* . . . Adjustable Clutch† Type

Type	Handle ¼" Air Inlet	Free Speed at 90# Pres.	CAPACITY Free Run. Screws	Bolt Size	Wt. (Lbs.)	Lgth. (Ins.)	Spindle Side to Center (In.)
S-02-PRC	Pistol	2000	#2 to #12	To ¼"	2¼	8¾	25/32
S-02-PRC	Pistol	850	#2 to #12	To ¼"	2½	9¼	25/32
S-02-PRC	Pistol	450	#2 to #12	To ¼"	2½	9¼	25/32
S-02-LRC	Lever	2000	#2 to #12	To ¼"	1⅞	10	25/32
S-02-LRC	Lever	850	#2 to #12	To ¼"	2⅛	10½	25/32
S-02-LRC	Lever	450	#2 to #12	To ¼"	2⅛	10½	25/32

*Also Non-Reversible †Also Positive Clutch and Direct Drive

Here's how to drive assembly costs down

WRITE FOR BULLETIN No. 46

Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

HOW HARLEY-DAVIDSON SPEEDS MOTORCYCLE PART PRODUCTION

Machines Both Ends in Single Chucking, Using No. 12 Automatic with Auxiliary Slide, Special Locator and Tool Relief

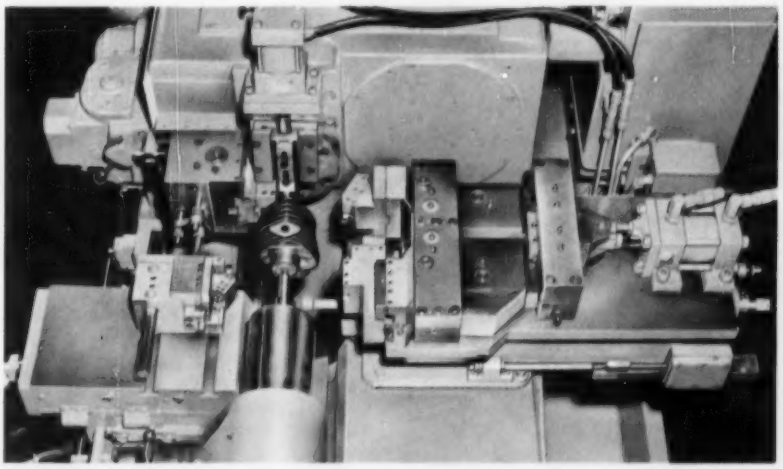
You may spot production ideas here from the way Harley-Davidson Motor Co. of Milwaukee, Wis., is handling cast iron rear and front cylinders.

A Gisholt MASTERLINE No. 12 Automatic Production Lathe is doing the job, machining 6 different sizes and types of workpieces. Smart tooling permits machining the maximum number of surfaces in the minimum amount of time. Change-over is especially fast and easy.

Here's a typical operating cycle: The workpiece is chucked in the rough machined bore on an expanding mandrel. A special headstock-mounted, air-operated locating stop speeds work handling. While tools in the front carriage move longitudinally to turn and chamfer both ends on one side of the piece, tools in a headstock-mounted auxiliary slide—operated through a rack and pinion actuated by front slide movement—move in to chamfer the I.D. on the other side. At the same time, tools on the rear slide move in to face both ends for length. At the end of the cut, tool blocks mounted on the rear independent slide automatically swing open to provide tool relief before withdrawal.

Floor-to-floor time on the part shown is 1.2 minutes. The other 5 workpiece sizes are easily handled by merely changing sleeves on the expanding mandrel and adjusting tools for the smaller sizes, and changing the mandrel itself for larger bore parts. Floor-to-floor times range from 1.8 to 3.6 minutes.

Standard No. 12 Automatic has flexibility to handle variety of parts with minimum change-over. Machining both ends in single chucking gives maximum accuracy, cuts production costs.



Workpiece and tooling, showing headstock-mounted locator, auxiliary slide, and special air cylinder which provides automatic tool relief for rear independent slide tools.

Three different types of workpieces handled, extra expanding mandrel and sleeves.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

REDUCE COSTS NOW WITH

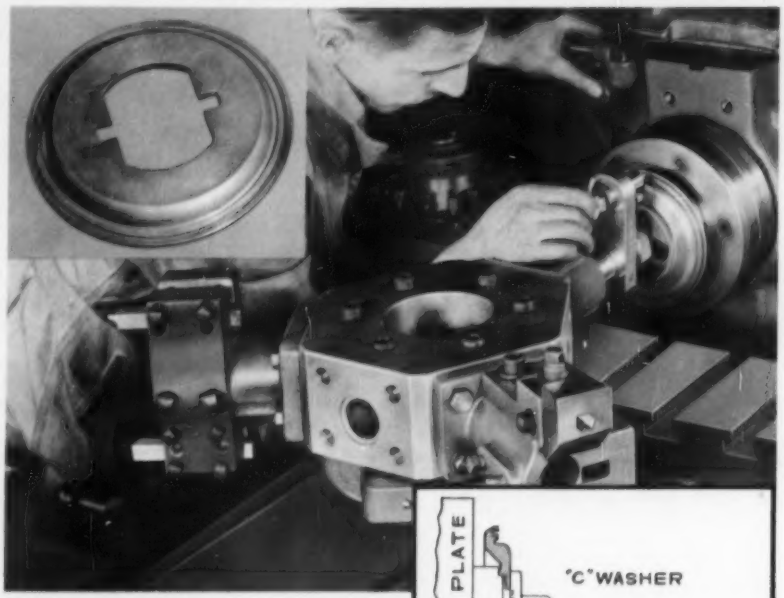
HOLDS DOWN COSTS ON TRICKY OPERATION

Accuracy and Adaptability of No. 4 Ram Speeds Machining of Type Bar Segments

There may be a production tip for you in this well-planned setup.

The workpieces are cast iron type bar segments, used in the printing industry. To keep costs at a minimum in an operation involving a close tolerance wire groove—requiring hand-feeding—the manufacturer is using a specially-tooled No. 4 Universal Ram Type Turret Lathe.

The part has been previously machined on one side. Location is on a centering plate, with the part held by a "C" washer and hand-stud. Rough and finish facing are performed by tools in the square turret. Forming and grooving operations are handled by tools on the hexagon turret. The close tolerance wire groove is finished, using a hand-fed tool with an indicator to assure correct depth of cut. The circular groove is cut through an .081" neck, and has a maximum diameter of .0967". Floor-to-floor time is a short 3.5 minutes.



Operator hand-feeds tool to machine wire groove in type bar segment, shown in inset.

Rigid turret and smart tooling combine to maintain close tolerances and cut costs in job requiring hand-feeding.

AiResearch BALANCES WITHIN "KISS OF A WHETSTONE"

Gisholt 1S DYNETRIC Balancer Puts Ultra-Precision Operation on Production Basis

Main product of the shops at AiResearch Industrial Division of the Garrett Corporation, Los Angeles, California, is turbochargers for diesel engines — dynamic, power-boosting accessories operating 40,000 r.p.m. or more.

With machining tolerances held in the "tenths," the job of balancing these assemblies is so close and critical that it must be "within the weight of metal removed by a whetstone stroke"! Here's how AiResearch is doing it—using a Gisholt 1S DYNETRIC Balancer.

For maximum accuracy, the components are balanced individually and as an assembly. Parts are rotated at 1500 r.p.m., with the standard stroboscopic lamp indicating exact angle of unbalance—and the amount meter telling the exact amount in terms of correction method employed.

Required accuracy is easily met by the standard Gisholt 1S, balancing the shafts to within 0.02 gram-inches, the compressor wheel to within 0.07, and the hot wheel to within 1.8 gram-inches. The same machine statically balances the exuder of the turbocharger to within 1 gram-inch.

Checking turbocharger rotating assembly for unbalance. Extremely small amounts of unbalance are measured and located through machine's infinitely variable amplification.

Variety of parts and assemblies is handled on high-production basis with Gisholt 1S Balancer, without loss of accuracy and with minimum setup and change-over.

Write for free copy of Bulletin 1109-B, giving basic information on theory of balancing and on the complete line of Gisholt Balancing Equipment.

GISHOLT

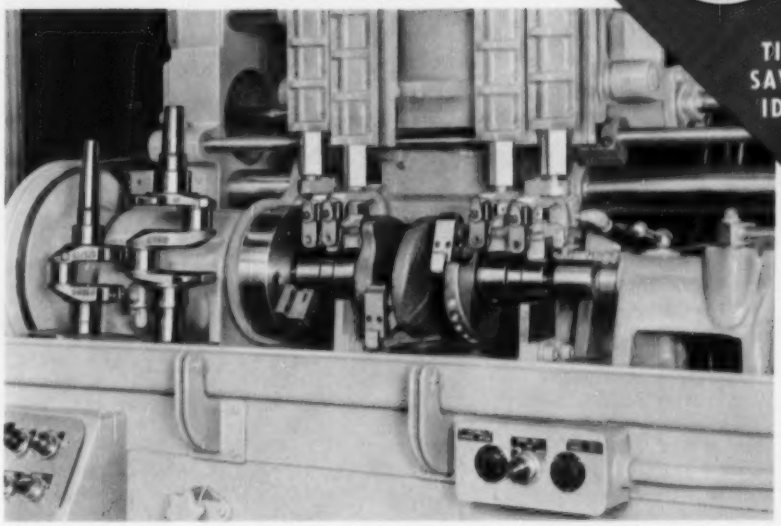
LOOK AHEAD... KEEP AHEAD... WITH GISHOLT

GISHOLT

TIME-SAVING IDEAS

WHAT ONAN IS DOING WITH SUPERFINISH

Handles Crankshaft Mains, Pin Bearings and Oil Seals Simultaneously—Gets Finer Finish at Lower Cost



Model 51A Superfinisher, showing crankshaft in place and 2 other sizes at left. Special upper-oscillating Superfinishing heads are used. Although machine has automatic cycle, note control buttons permitting manual operation if desired.

This pointer reveals how D. W. Onan and Sons, Inc., Minneapolis, has put crankshaft finishing on a high-production basis—using a Gisholt Model 51A Superfinisher.

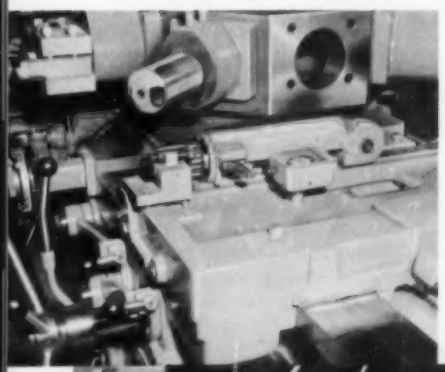
The machine is tooled to handle up to 6 different diameters in one operation, on a variety of single- and 2-throw crankshafts. Loading and unloading of larger crankshafts are made fast and simple, with loading rails and special spindle-inching arrangement to position the driver.

Here's a typical operating cycle: Crankshaft is placed between centers, driving from keyway with faceplate driver. Two special latch-on, follower-type arms are engaged with the crank pins and 4 longitudinally adjustable quills descend to Superfinish main bearing and oil seal surfaces. The main and pin bearings are taken from a ground surface of 30 micro-inches down to 8 or less. The oil seal surfaces on the shaft ends are Superfinished down to 4 micro-inches RMS, or less.

Here, Superfinishing handles 44 to 53 pieces per hour with 80% efficiency—with 1-hour change-over from one crank size to another. Each set of stones Superfinishes over 200 crankshafts on this job.

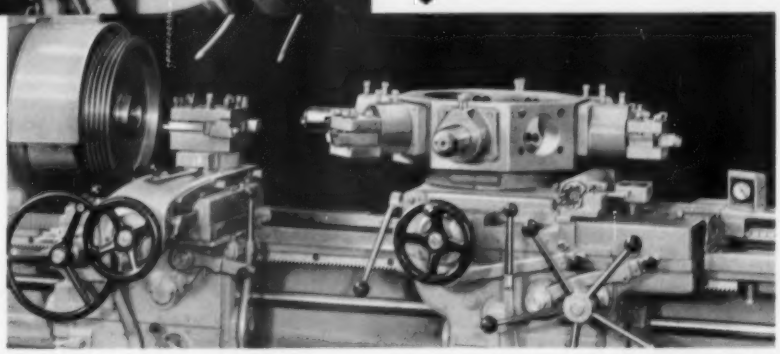
ONE WAY TO TRIM COSTS IN SHEAVE PRODUCTION

3L with Octagon Turret Provides Ample Capacity to Handle This Job and Variety of Other Work



"Tenth" indicators assure maximum accuracy, reduce possibility of operator errors. Cross-feeding turret stop roll simplifies operation on cross-feeding cuts.

Workpiece shown after second operation. Standard tools on the cross-feeding turret keep costs at a minimum.



Simple jobs like this prove the value of cost-cutting special features on the Gisholt 3L Saddle Type Turret Lathe.

Workpieces are 20" diameter cast iron sheaves, machined in 2 fast operations. Tooling costs are held to a minimum through use of the cross-feeding octagon turret, which lets standard tools perform facing, forming, boring and chamfering operations. Tools on the square turret turn the O.D. and face the rim of the part, form the grooves on the O.D. and also chamfer.

Special features on the 3L improve accuracy and reduce setup time. The 8-position cross-slide stop roll is used to automatically trip cross-feeding movements of the turret. "Tenth" indicators simplify and speed up cross and longitudinal positioning, and make it easier to work to the accuracy required on these parts.

3L has versatility to machine sheaves to high degree of accuracy in minimum time, plus necessary capacity to handle all types of intricate jobs. "Tenth" indicators and turret stop rolls simplify work.

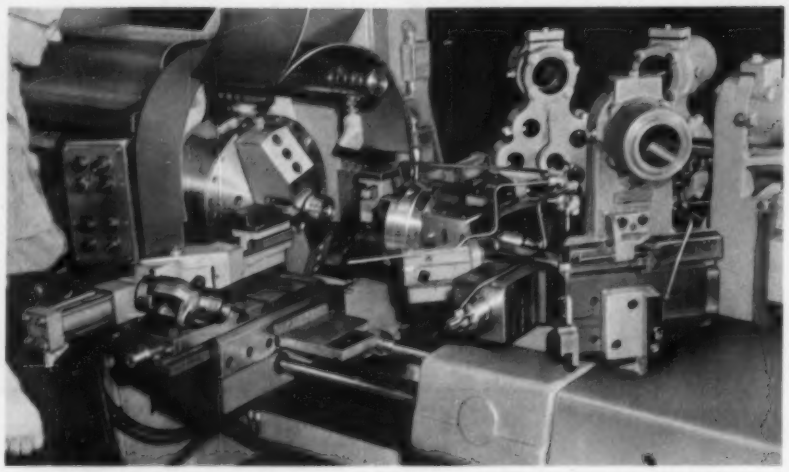
GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

HOW EDWARD VALVES DIV. MACHINES, THREADS WITH FASTERMATIC

Threading Operation, Reverse of Spindle Included Within Automatic Cycle



MASTERLINE Fastermatic with octagon turret, tooled to perform first machining operations on 1½" steel Univalve bonnet forgings.

You'll like the way Edward Valves Division of Rockwell Mfg. Co., East Chicago, Indiana is machining 1½" steel Univalve bonnets with this setup.

The machine used is a new Gisholt 2F MASTERLINE Fastermatic Automatic Turret Lathe.

The job is completed in 2 chuckings, working with an 18" 2-jaw hydraulically operated chuck. In each operation the octagon turret carries necessary tools to handle all external and internal work, with facing completed from front and rear cross slides.

The first operation is on the bonnet end of the part. Threading the O.D. is part of the automatic cycle, using a collapsible die head. A 2-speed motor provides correct spindle speed.

In the second operation the I.D. is threaded on the other end, with the spindle automatically reversing to withdraw the tap. Operator's job is made easy through features like electric toggle switch control panel to simplify setup—permanent gauge on octagon feed cam drum for quick positioning during changeover—automatic positioning of spindle at end of cycle to simplify loading and unloading operations.

Floor-to-floor time for the first operation is 8.5 minutes (including drilling, counter-boring and threading) and 2.8 minutes for the second operation to finish the valve seat.

Octagon turret provides tool capacity to complete job in 2 chuckings. Automatic cycle eliminates human error, lets operator handle additional units or do other work.

SIMPLIFIES LOADING OF COMPRESSOR DISCS

Air-Operated Pusher on Simplimatic Assures Positive Location

Air cylinder in foreground pushes workpiece against locating stops to simplify chucking part before machining operation starts. Table feed saves special tooling costs by engaging tools with work before standard slide movements begin.

Here's how the addition of a simple device has reduced operator fatigue and improved over-all efficiency. The device is an air-operated pusher, used on the Gisholt Simplimatic Automatic Lathe to speed work loading.

Workpieces are 24" diameter, aluminum compressor disc forgings for jet engines. Ordinarily, the large diameter and thin web section of this type of part make accurate locating and chucking especially difficult. With this setup, the operator simply moves the part into position and actuates the air-operated pusher, which holds the work firmly against locating stops while it is being chucked. Wide jaws are used to eliminate distortion.

All tooling is carried on standard slides, mounted at correct angle on wide platen table which—after chucking—feeds forward to engage tools with work. The rear slide is mounted at an angle to let tools perform an angular facing operation, while tools on the front slide machine 4 other faces and rough-turn the flange diameter. F.t.f. time is just 5.5 minutes.

Special device on Simplimatic makes loading faster, easier. Wide platen table promotes easy mounting of tool slides to correct angle for maximum efficiency.

11-1256
668

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

the finest high speed lathes

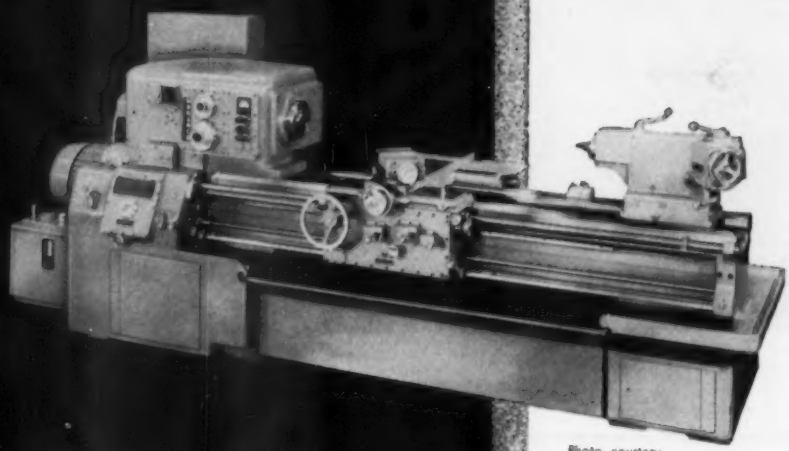
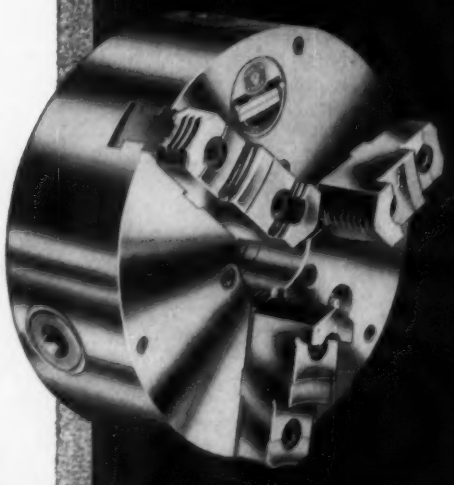


Photo courtesy
The Monarch
Machine Tool Co.

This is Monarch's Series 62 with Preselector Dyna-Shift designed to increase productivity and lengthen tool life. This fine lathe is typical of the quality machine tools built by Monarch. Write for Booklet #1505 for complete data. The Monarch Machine Tool Company, Sidney, Ohio.

deserve the finest precision chucks



This is Horton's 3-Jaw Scroll Universal Chuck which for over 100 years has been the ideal complement to the world's finest tool room, general purpose and production lathes. Its precision and lasting accuracy make it a part of any production picture. For the complete story on this and Horton's complete line of precision chucks, see the Horton people in your area now.

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Since 1851
CHUCK

HORTON CHUCK DIVISION
GREENFIELD TAP AND DIE CORPORATION
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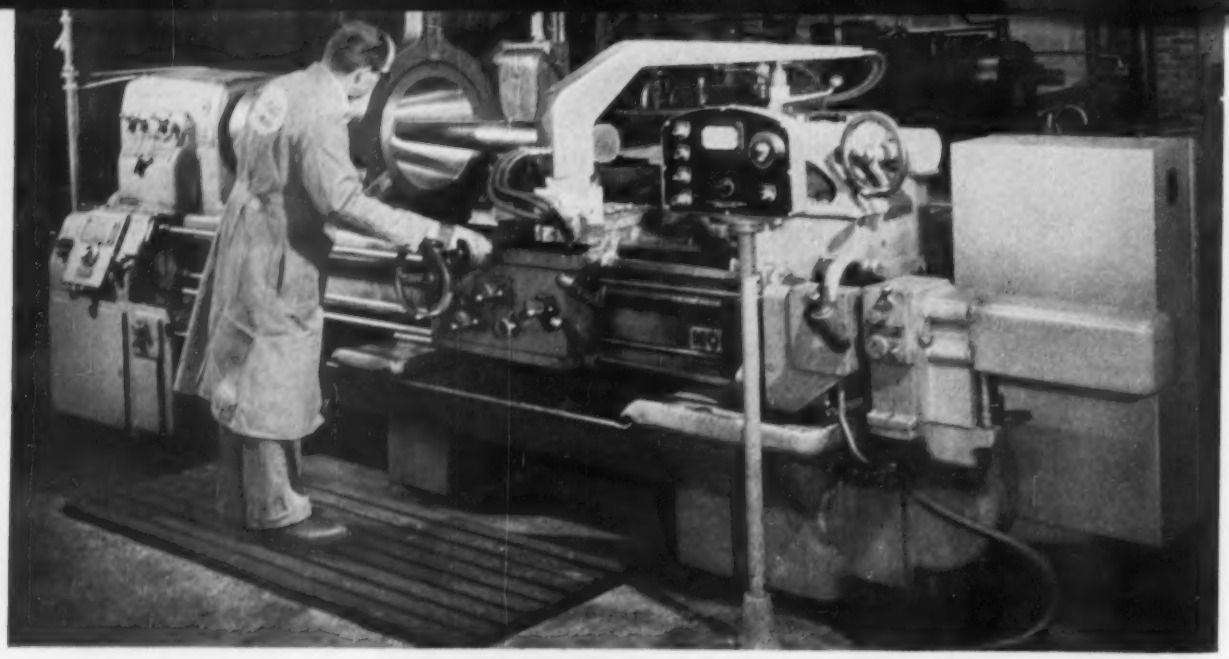
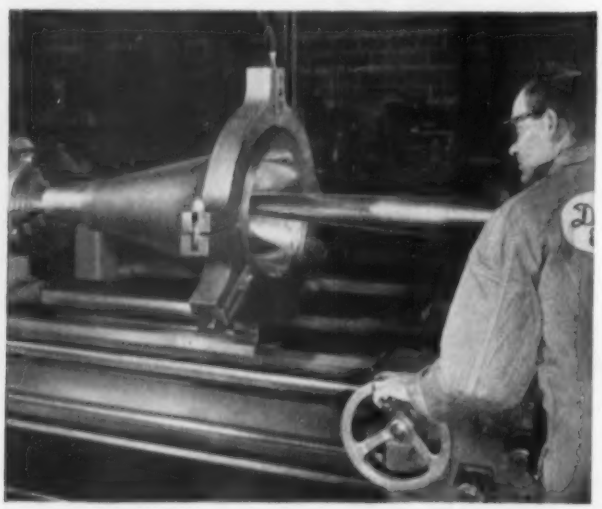


A Monarch 20" Series 61 Swiveling "Air-Gage Tracer" Lathe contour boring a jet cone to a depth of 31½". The I. D. starts at approximately 18½" and decreases to approximately 4". The contour of the I. D. has a radius and blend tapers. Material is the tough super-alloy called A-286, one of the toughest of all the new super-alloys to machine. "Some jobs", says Diversey's president, "can only be done on Monarch swiveling-type tracer lathes".

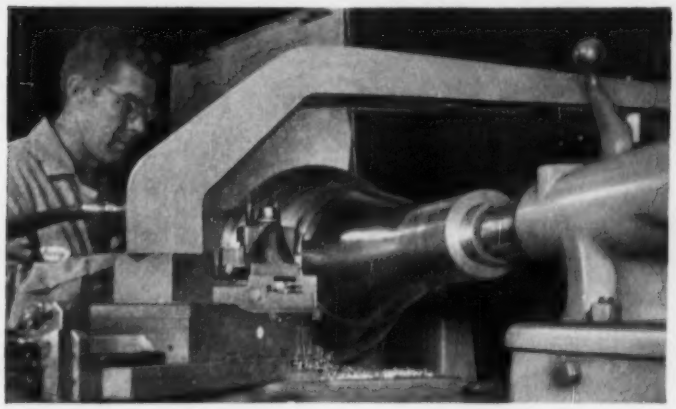


Hitch up the talents of DIVERSEY ENGINEERING COMPANY, Franklin Park, Illinois and their tracer-controlled Monarch lathes, and you get one of the most important production teams in our jet engine and guided missile programs.

Starting with one Monarch lathe seven years ago, Diversey is now the largest in the country specializing in these components. Fifteen lathes—an exclusively Monarch installation—are now in practically around-the-clock use. All but two are tracer-controlled. Latest is a 48" swing swiveling Air-Gage Tracer type machine, the capacity of which places Diversey in the position of being one of the few companies in the United States with the equipment and know-how to handle machining on some of the large, new guided missile contoured parts.

Monarch's tracer controlled lathes are more than the Secret Weapon's secret weapon—they're everybody's weapon for better production. Yours too! Ask for Booklet #2608 —or a sales engineer . . . **The Monarch Machine Tool Company, Sidney, Ohio.**

The same Series 61 turns the same jet cone, described on opposite page. This operation uses practically the full swing capacity of the lathe.



"GUIDED" LATHES for Guided Missiles

Contour Turning of "Super-alloys" Made Easy

A Monarch 20" Model M "Air-Gage Tracer" Lathe finish machines the center bulkhead of a guided missile to 63RMS. Material is heat-treated hi-nickel alloy. In the foreground of above illustration is a number of completed bulkheads while toward the tail end of the machine are some nose cones for a missile head. These are also turned on the 20" Model M. Smaller view (above right) shows clearly the unusual finish imparted.

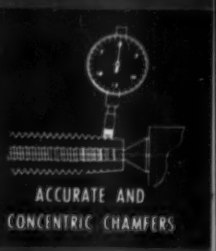
Monarch

TURNING MACHINES

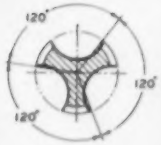
ACCURACY • ECONOMY • LONG LIFE

FOR A BETTER TURN FASTER . . . TURN TO MONARCH

PRECISION CHIP
DRIVER CONTOURS



ACCURATE AND
CONCENTRIC CHAMFERS



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UNIFORM
FLUTE CONTOURS

FOR A PRODUCTION BONUS—

BALANCED ACTION

There are many mechanical and technical superiorities in the design and manufacture of Winter Balanced Action Taps. These give you a production bonus in size control and in prolonged tool life.

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WINTER BROTHERS COMPANY

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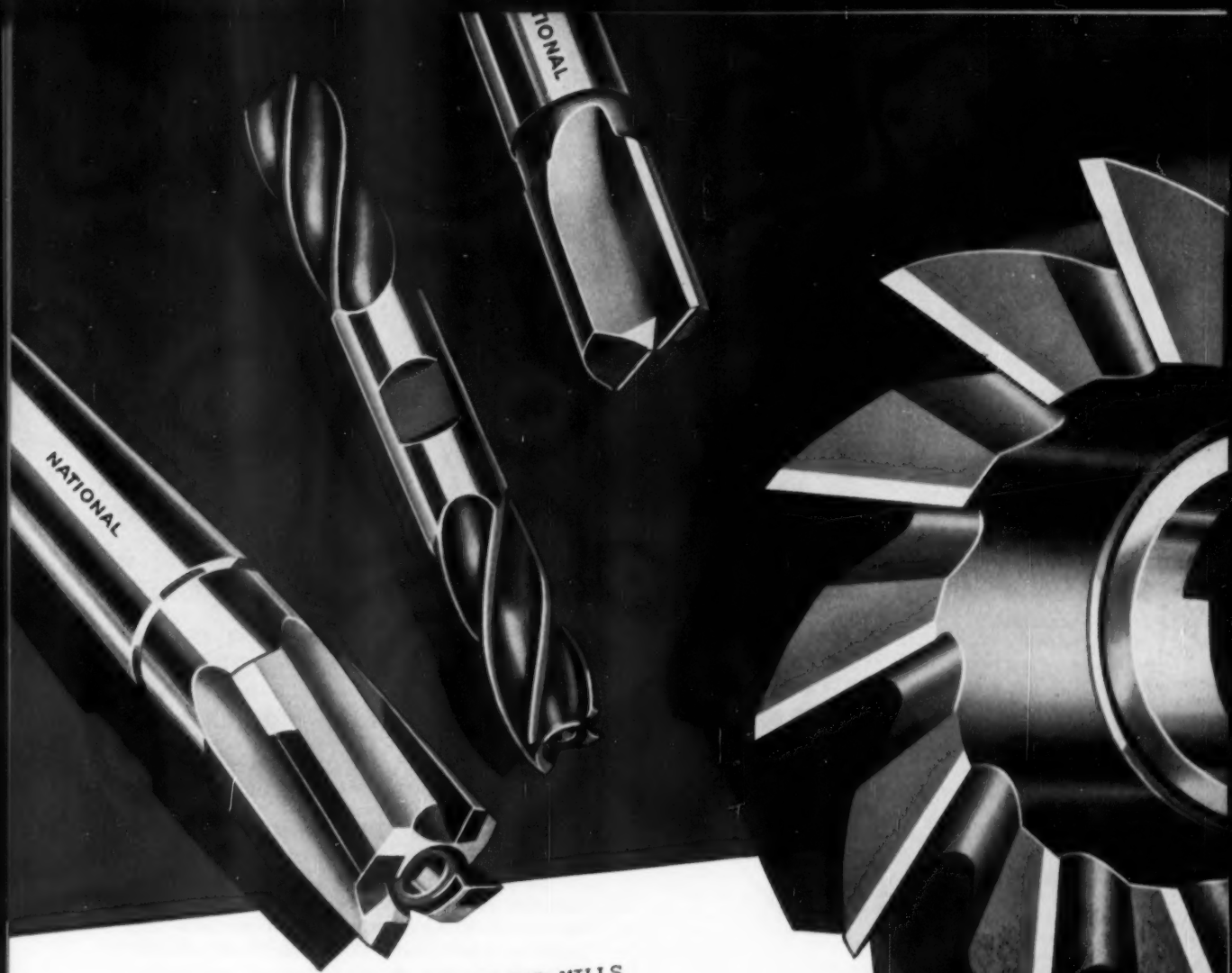

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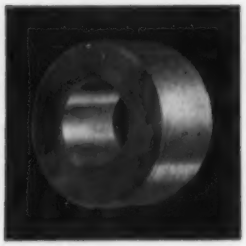
precision reaming **CUTS HOLE FINISHING COSTS**



BARBER-COLMAN offers

Close control of size and finish

Consistent duplication of accuracy

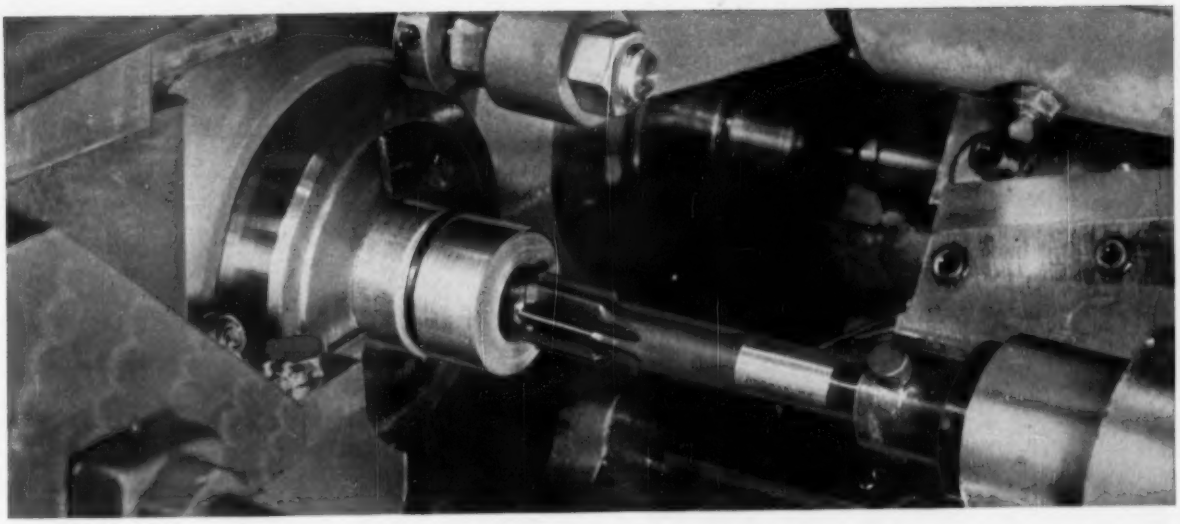
Minimum finishing stock

Fewer finishing operations

Important job economies are being obtained in hole finishing operations with Barber-Colman standard "oil feed" reamers. Close control of size and finish reduces the number of finishing operations required and results in shorter finishing time. Because reamer diameters are held to a tolerance of +.0002", −.0000", reamers can be drawn from stock and put to work immediately on the machines, with assurance of consistent hole accuracy. This eliminates the usual machine downtime for hand working the reamers and size checking.

Through careful tool design and accurate sharpening, reamers are made to suit the specific job characteristics, so that better cutting action produces fewer stresses, and

Barber-Colman Oil Feed Reamer



consequently less distortion in heat treating. As a result, less finishing stock is required for honing after hardening.

Cost savings benefits such as these are evidenced in the Barber-Colman "oil feed" reamers used to size bores in planetary gear blanks. Blank bores are finished within .7536"/.7543" I.D. to 15-60 rms. Since reaming produces blanks within the close tolerances required for accurately cutting the gear teeth, a series of successive finishing operations formerly required have been eliminated, greatly reducing cost per finished hole. Minimum stresses produced as a result of reaming confine heat treating distortion to normal shrinkage of the hole. Consequently, in this case, the hole is reamed to final size, and it is only necessary for honing to remove the amount of shrinkage. The job facts as shown illustrate the production accuracy and finish obtained:

Barber-Colman reamer design produces sharp cutting edges with positive primary clearance on the land, rather than a cylindrical land, to provide a shearing action cut. These sharp edges with irregular flute spacing produce smooth cutting with uniform finish and accuracy which cannot be obtained with conventional reamers. These reamers also have a slight right hand helical flute with an oil hole drilled through the center of the reamer so that the cutting oil will force the chips back between the flutes, contributing to fine finish.

Semi-Finished Bore Diameter	.7536"/.7543"
Maximum Taper Allowable	.0001"
Bore Square and Parallel with Face of Blank	.0003"/.0005"
Concentricity with O.D.	.002"
Production	200 Blanks per Hour
Cutting Time	17 Seconds
Cutting Speed	302 rpm.
Stock Reamed	.008" to .009"
Finish	15-60 rms.
Bore Depth	.820"
Feed	.025"

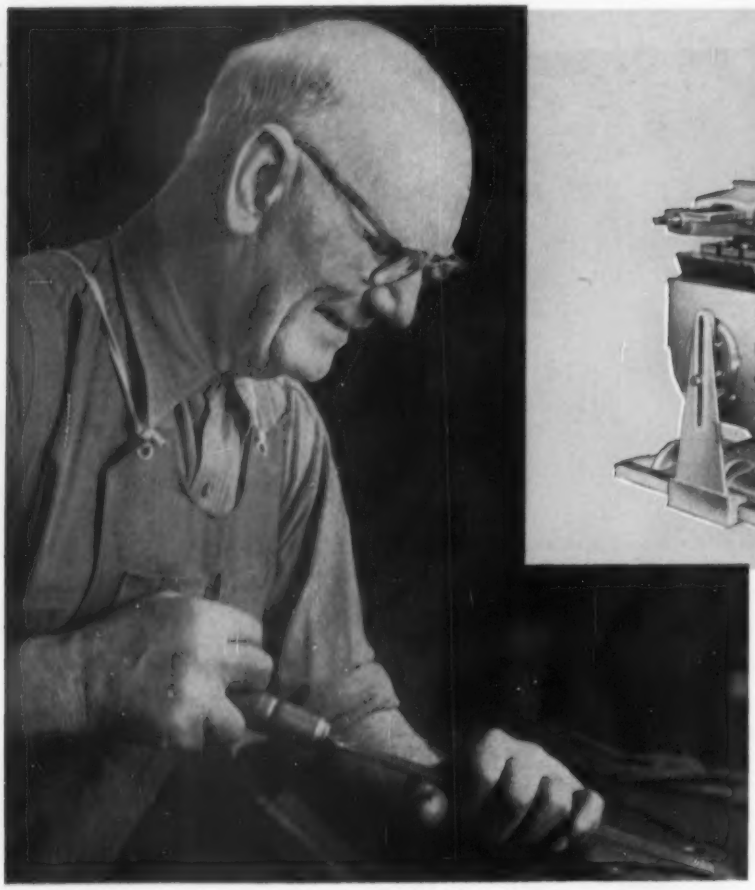
When you have hole finishing problems involving close limits of accuracy and a series of operations, call a Barber-Colman reaming expert and talk over with him the most economical way to get the finish and accuracy you want. You will find substantial production savings possible, both in cost and time.

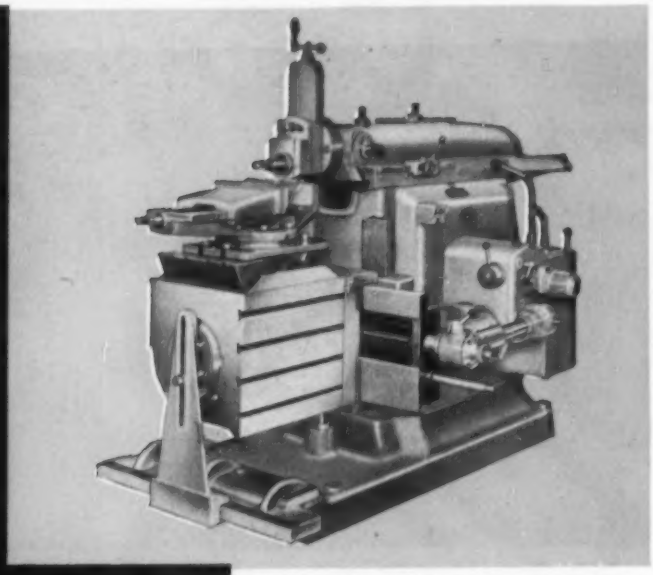
BARBER-COLMAN COMPANY

9110 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN





VMA Universal Shaper Model ES-26

UTOMORDENTLIG YRKESSKICKLIGHET

(SUPERB CRAFTSMANSHIP)

VMA SHAPERS - built by Sweden's master craftsmen - are engineered to maintain precise tolerances in continuous heavy-duty production. Built to U. S. standards, VMA Shapers—both heavy duty and standard models — meet all requirements for modern versatile machines.

VMA Model ES Heavy Duty Shapers, available in Plain and Universal Models and with 18", 22", 26", and 28" stroke, feature:

- Wide selection of ram speeds and power feeds
- Automatic forced lubrication system
- Horizontal power rapid traverse of table through independent motor
- Double helical crank gear
- Chrome nickel steel transmission
- Anti-friction bearings throughout
- Dependable safety clutch

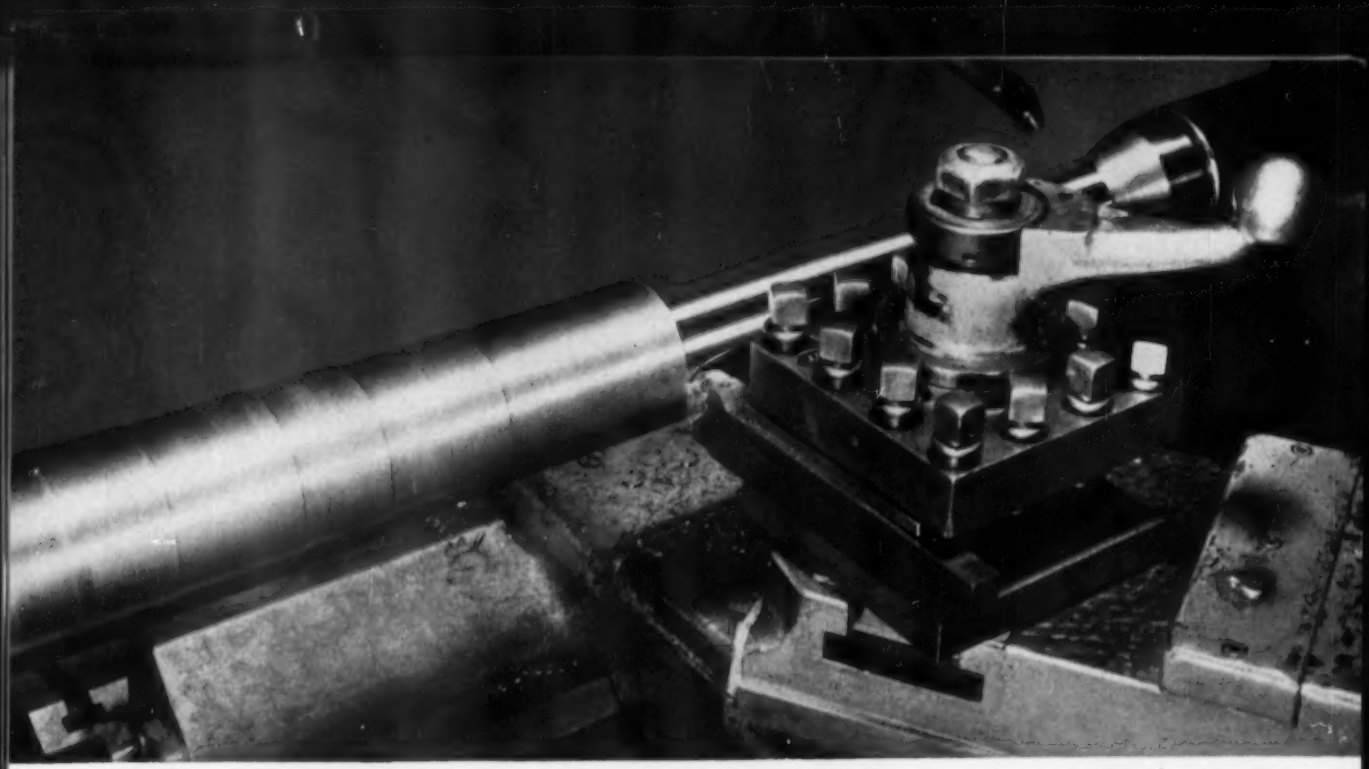
VMA Model EV Series . . . economical standard-duty Shapers with stroke lengths from 14" to 24".

- Highly accurate and dependable, Model EV Shapers are ideal for job shop or tool room use not requiring the extra power of the ES Series. Easy to operate — economical to own.

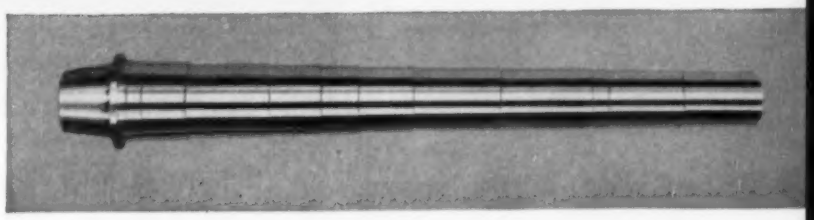
austin

INDUSTRIAL CORPORATION

76-F MAMARONECK AVENUE • WHITE PLAINS, NEW YORK



Carboloy Cemented Oxide finishes 31-inch lathe spindles in 2.8 minutes at R. K. LeBlond Machine Tool Co. Carbide tool used previously required 6 minutes. With the Cemented Oxide tool, the 12-step cut is made at 715 fpm – more than double the speed with carbide. Work finish is improved, and machine output is increased 45% per grind.



Takes up where carbides leave off...

FINISH STEEL WITH CARBOLOY CEMENTED OXIDE; GET FINER FINISHES AT HIGHER MACHINE SPEED

With new Carboloy® Cemented Oxide, you can finish steel faster than ever before possible. Specially developed for machining at speeds beyond the range of carbides, Cemented Oxide produces superior surface finishes, while reducing your machining costs.

Cuts faster, wears longer

Field and laboratory tests show Carboloy Cemented Oxide can be used effectively at speeds from 300 to 7500 fpm, on steels up to 300 Brinell. It cuts cleanly, resists edge wear and cratering at surface speeds which would quickly ruin other cutting materials.

Carboloy Cemented Oxide brings you two major advantages: It lets you cut faster – and therefore more efficiently – with your present equipment; it reduces the time required to complete a job. And, its unusual wear-resistance at these high speeds means less downtime for tool changes, lower tool and grinding costs.

Resists chipping, stays cool

Cemented Oxide is an entirely new kind of cutting material. It is harder than carbide, stronger and more resistant to chipping than typical ceramics. Even at extremely high operating speeds, the tip stays so cool it can be touched immediately after the cut.

With Cemented Oxide Grade 0-30 and the three Carboloy extra-performance carbide grades, you now have a specialized cutting material available for every steel-cutting job from roughing to super high-speed finishing. Limited quantities of Cemented Oxide Grade 0-30 are ready for evaluation on your finishing jobs. For information or technical bulletin, send the coupon on page 4 of this advertisement.

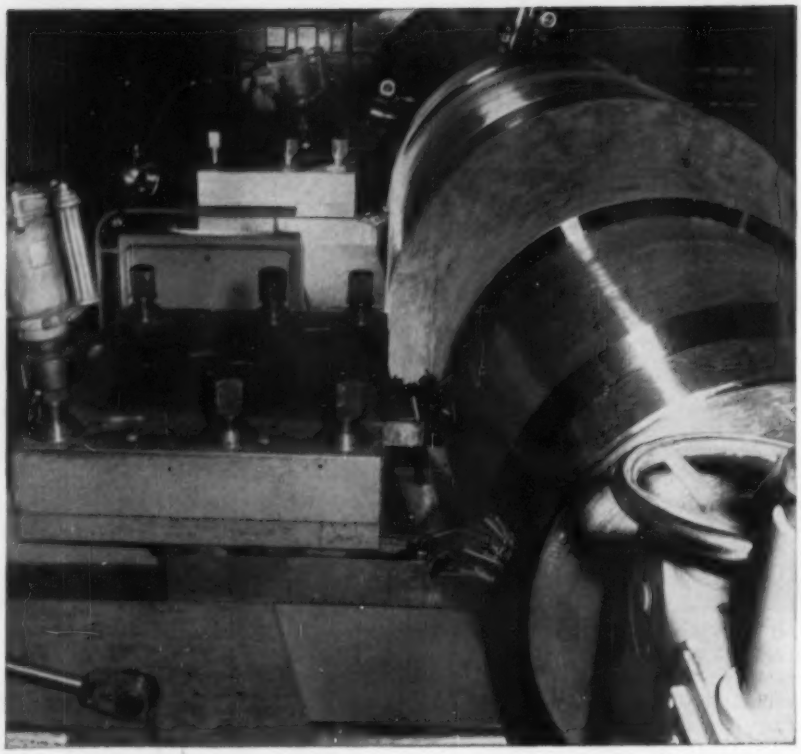
CARBOLOY
CEMENTED OXIDE

GRADE 370

EXTRA-PERFORMANCE CARBIDE FOR HEAVY-DUTY ROUGHING

Grade 370 is built to take heavier roughing cuts at higher speeds and feeds . . . yet outlast conventional carbides. Hundreds of in-plant tests have proved Grade 370 will remove more metal per minute – and take more regrinds – than any other grade.

For example, on huge steel backup rolls like the 31-ton roll at right, a single Grade 370 insert has removed 24,000 cubic inches in 2½ hours . . . without regrinding. Cutting through rough scale and hard seams, Carboloy Grade 370 tools will finish this job in 16½ hours.



For every job from roughing to finishing . . .

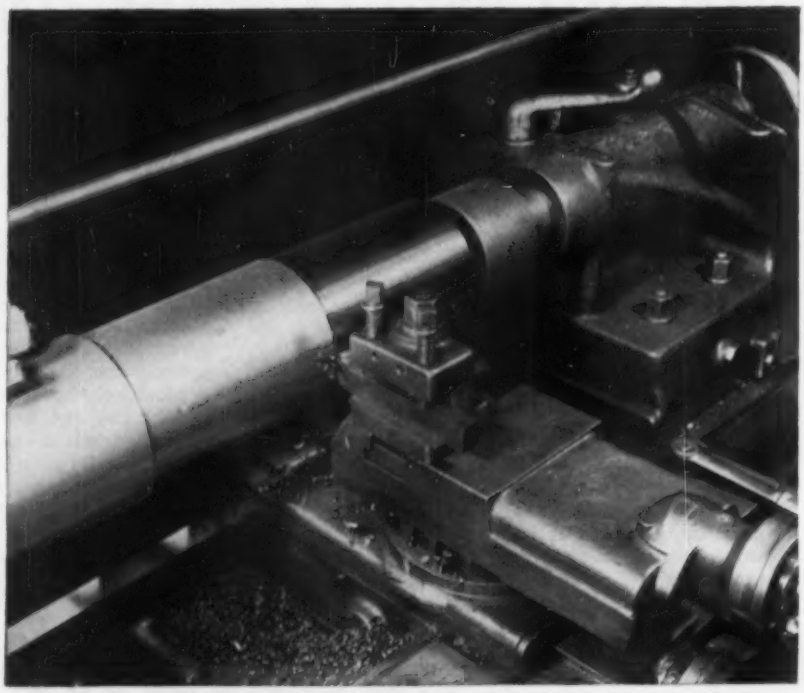
CUT STEEL FASTER, LOWER TOOL COSTS WITH

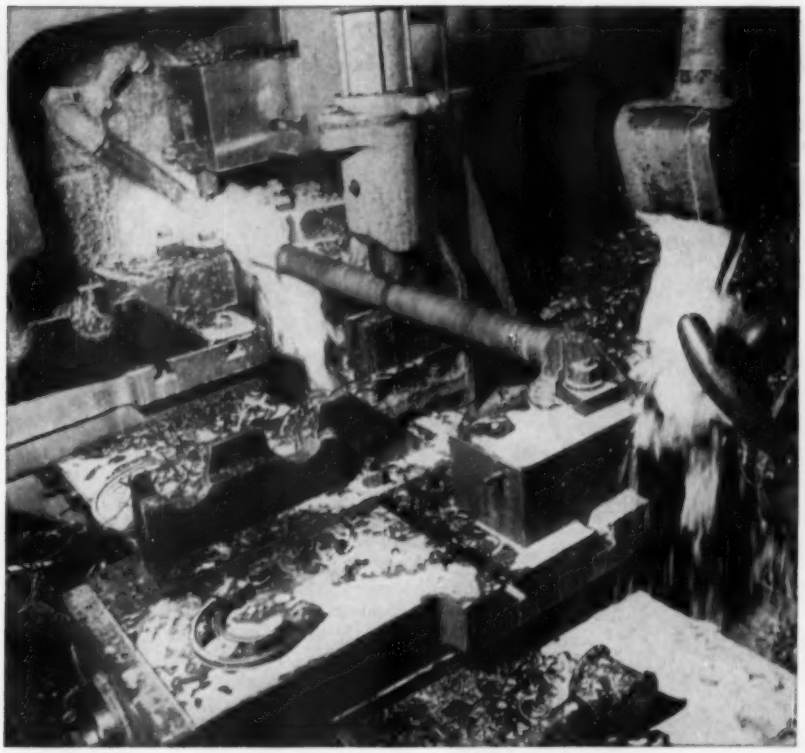
GRADE 330

EXTRA-PERFORMANCE CARBIDE FOR FINISHING AND BORING

New Carboloy Grade 330 is twice as strong as conventional steel-finishing grades. Its entirely new composition makes 330 easier to braze, yet more resistant to chipping. Unlike other finishing grades, Grade 330 is so tough it can be ground on automatic grinders without cracking.

Grade 330 can take speeds 10% higher than other carbides, without loss of tool life. When compared at a series of speeds ranging from 600 to 1900 fpm, Grade 330 outlasted other grades by 20%-35%. (Picture at right shows surface finish obtained on S.A.E. 1045 steel at 800 FPM.





GRADE 350

EXTRA-PERFORMANCE CARBIDE FOR MEDIUM-DUTY MACHINING

Grade 350 was specially developed to increase your machines' efficiency in the light roughing and general finishing range. Built-in structural rigidity enables Grade 350 to withstand steel-cutting conditions which quickly cause tip deformation in ordinary carbides. Its extra strength gives you more production per grind, more grinds per tool.

For example, in machining the AISI 4150 truck axle forging at right, Grade 350 boosted production 33%. In addition, Grade 350 eliminated chipping and flaking encountered with other carbides.

CARBOLOY EXTRA-PERFORMANCE CARBIDES

- ▶ **Take heavier, deeper cuts with Grades 330, 350, 370**
- ▶ **Get increased production from machines and manpower**

Announcement of new Grade 330 means you now have a choice of *three* Carboloy extra-performance steel-cutting carbides.

New Grade 330 takes up on finishing and boring jobs where medium-duty Grade 350 leaves off. And together with heavy-duty Grade 370, these carbides offer you faster cutting at lower cost over the complete steel-cutting range from roughing to finishing.

Outperform conventional carbides

Service-proved on thousands of applications like the ones above, these grades consistently outperform conventional carbides. Even at higher speeds and feeds, they take heavier, deeper cuts . . . yet outwear other grades.

Their superior strength means more production per hour, greater output per machine. Their resistance to wear means less downtime, fewer wasted man-hours for tool changes, and lower tool costs.

Complete line stocked locally

All three of these extra-performance carbides are stocked locally by your Authorized Carboloy Distributor. They are available in a complete line of standard tools and blanks, as well as inserts for your toolholders.

Try these extra-performance carbides in your plant . . . and see why there is no such thing as an "equivalent grade" for Carboloy 330, 350, and 370. For more information, see your Carboloy Distributor, or mail the coupon on page 4 of this advertisement.

CARBOLOY
CEMENTED CARBIDES

CUT MACHINING COSTS, SAVE SETUP TIME WITH CARBOLOY MACHINABILITY COMPUTER

- ▶ **Determine most efficient cutting conditions in seconds**
- ▶ **Eliminate wasteful tryout runs, save valuable stock**
- ▶ **Get closer control over inventories and production schedules**

How the Machinability Computer is helping Scully-Jones and Co.

Original operating standard for machining expanding shells called for 244 minutes per part. But by calculating the optimum combination of speeds, feeds, and other data on the Computer, the company saved 77.8 minutes per part. Machining time was cut 32% . . . 17 machining hours were saved on a 13-piece run. Scully-Jones used the Computer to determine correct setups for both HSS and carbide tools—on turning, facing, drilling, and boring jobs.

Scully-Jones and Co., Chicago, is just one of hundreds of plants now getting greater production from their machines by using the Carboloy Machinability Computer.

Machining data are fed into the Computer . . . and in seconds, optimum speeds, feeds, horsepower ratings, or any of 16 other operating variables are accurately figured for the machinist.

On the job above, for example, the Computer showed how to cut machining time 32% on a 13-piece run . . . saving 17 machining hours and eliminating wasteful tryout runs.

Benefits extend plant-wide

On other jobs throughout the plant, the Computer establishes new operating standards, corrects and verifies existing ones . . . in a fraction of the time previously required.

In addition, the Computer simplifies inventory problems by predicting rate of tool wear. It aids grinding rooms plan work loads; helps management coordinate production schedules. The Computer is a versatile engineering tool for any sized plant.

Ask for demonstration

Price of the Carboloy Machinability Computer is $495, f.o.b. factory, Detroit. It is battery-operated, portable, and rugged; can be used by anyone with machining experience after a short familiarization period.

For more information on how the Computer can help your plant increase production and reduce manpower costs, mail the coupon below. If you wish, we will gladly arrange a demonstration in your plant.

Metallurgical Products Department
General Electric Company
11149 E. 8 Mile Road, Detroit 32, Mich.

Send me information on the following products:

- ☐ Carboloy Cemented Oxide Grade 0-30
- ☐ Steel-Cutting Grades 330, 350, and 370
- ☐ Carboloy Machinability Computer
- ☐ Have a representative make an appointment to demonstrate the Computer

CARBOLOY
MACHINABILITY COMPUTER

Name_____

Title_____

Company_____

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Carboloy is a trademark of General Electric Company

IN INLAND STEEL'S ROLL DEPARTMENT

New Mack-Hemp electronic contouring lathe removes metal at peak rates with .001" accuracy

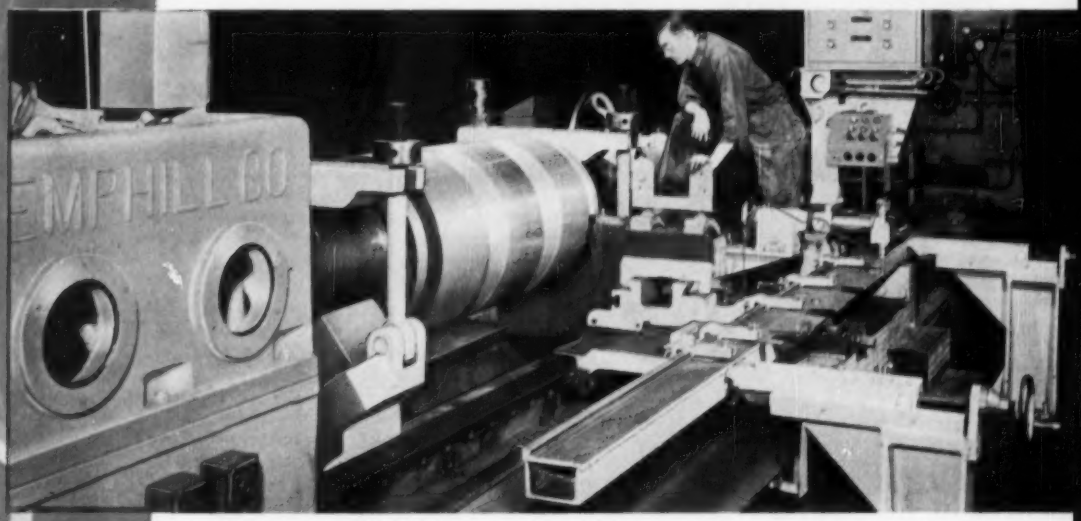
An electronic "pilot" guides this 48" Mackintosh-Hemphill contouring lathe recently installed in the Roll Department at Inland Steel Company's Indiana Harbor Works. It is so precise that the lathe can finish contours into a roll without deviating more than .001" from the pattern on the full-size template.

Stylus contact with the template controls the lathe's longitudinal- and cross-feed motors through electronic linkages. Thus, dual feed motion response of the tool holder carriage is instantaneous and smoothly continuous. Any conventional groove shape can be duplicated—it is even possible to make an accurate cut on a shoulder vertical to the axis of the roll.

But this precision of control is only one reason why the big lathe can turn shape rolls so rapidly. It has been designed and built to handle some of the heaviest torsional loads ever imposed on a lathe. For example:

It can operate continuously through a ⅞" cut depth with feeds between .060" and .100", and with spindle speeds up to 62 RPM. It can turn rolls or forgings 50" in diameter and 18 feet long.

If you are planning to install new large-roll turning capacity, you'll be wise to investigate these cost-cutting automatic contouring lathes. Write us today for complete information. They're available in 48", 60" and 72" sizes.



Inland's new 48" Mack-Hemp automatic lathe here is cutting passes into a new roll for a 3-high structural mill that rolls 15" I-beams. Hardness of the roll is 42 Shore.

MACKINTOSH-HEMPHILL
DIVISION OF
E. W. BLISS COMPANY

Makers of the rolls with the Striped Red Wabblers

MACKINTOSH-HEMPHILL DIVISION · PITTSBURGH-U.S.A. · BLISS

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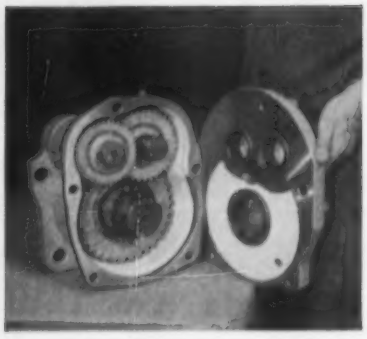
cast mill rolls • Johnston cinder pots • rotary tube straighteners • end-thrust bearings
heavy duty lathes • steel and special alloy castings

TRACK PINS AND DEAD AXLE SHAFT are subject to heavy stress and strain when the Oliver "OC-18" Industrial Crawler Tractor goes into action. Republic Cold Finished Steels at these vital points absorb shocks and wear of the most rugged service . . . help maintain Oliver's reputation for dependable performance plus economy of operation. Inset shows "OC-18" hard at work on Ohio Turnpike construction.



GEARS TRANSMIT POWER with maximum dependability when designed to make full use of Republic Alloy Steel's excellent physical properties. Formulated to provide great strength, toughness and wear resistance, Republic Alloy Steels allow bulk-free designs requiring less power to start and stop. Republic Metallurgists can help you apply these steels to your product. Mail coupon for full information.

LARGE TONNAGE, LOW WEIGHT are cost-saving features of this new Stainless Steel Volume Van. High strength-to-weight ratio of stainless allows thinner lighter sections with no loss of strength or safety. Result: 35% extra payload capacity. Republic ENDURO® Stainless Steel also offers exceptional abrasion and corrosion-resistance — best choice for long-term beauty plus low maintenance.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

IN TRACK PINS AND DEAD AXLE SHAFT

Republic Cold Finished Steel transmits 17 tons of driving power

When the mighty Oliver "OC-18" Crawler Tractor leans into a clay bank under full power, king-size forces are exerted against the dead axle shaft and track pins. That's why the Oliver Corporation specifies Republic Cold Finished Steel for these vital parts in the 21-ton giant of their line.

Enormous push and pull strains and shocks are normal in the rugged service the "OC-18" is built to deliver. To protect final drive assembly from undue abuse, a four-inch Republic Cold Finished Alloy Steel Bar is used for the dead axle shaft. Combining extremely high strength and toughness, plus outstanding abrasion and corrosion-resistance, Republic Alloy Bars are more than a match for the tremendous forces involved.

Equal dependability for "OC-18" track pins, is provided by Republic Cold Finished Carbon Corrected Steel. Years of service on other Oliver models have proved this material exceptionally resistant to fatigue failure. In addition, maximum service life is assured by Republic's consistent quality . . . the basis for uniform surface hardness in each pin.

In countless other industrial applications, Republic Cold Finished Steel maintains superior standards of performance. Ultimate strength, yield point and hardness of any given steel analysis show marked improvement after cold drawing. Also, production economies can often be effected by taking advantage of the straightness, smooth surface, accurate size and excellent machinability of Republic Cold Finished Steel.

It will pay you to consider Republic Cold Finished Steel in terms of your production and application problems. Simply contact your local Republic Office or mail coupon for further information, today.

UNIFORMLY STRONG IRON POWDER PARTS are easier to achieve when you specify Republic Iron Powder. Its high green and sintered strength simplifies your processing and handling. Particle size and apparent density are carefully controlled. Uniform consistency is assured. Republic can help you determine suitability of your parts to iron powder production—or recommend other methods and materials.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-2148
3102 East 45th Street • Cleveland 27, Ohio

Please send me further information on:

☐ Cold Finished Steels ☐ ENDURO Stainless Steels
☐ Alloy Steels ☐ Iron Powder

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

dixi 60

horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

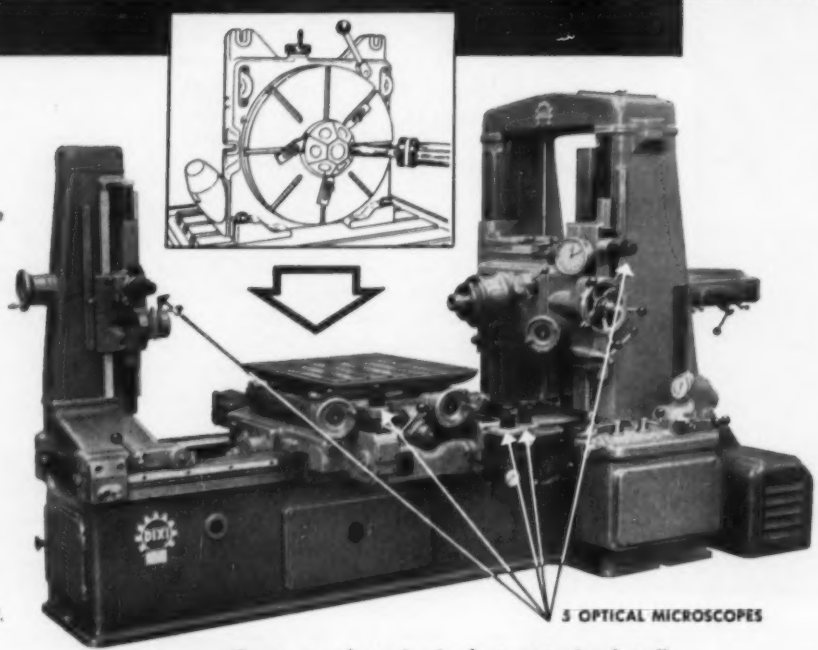
ACCURACY
Overall accuracy of .0002"

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅛". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



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- ***Engineering staff available for consultation***
- ***Spare Parts in New York stock***
- ***Your operators trained***

DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.

Names available upon request.

SEE THIS VERSATILE MACHINE IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.

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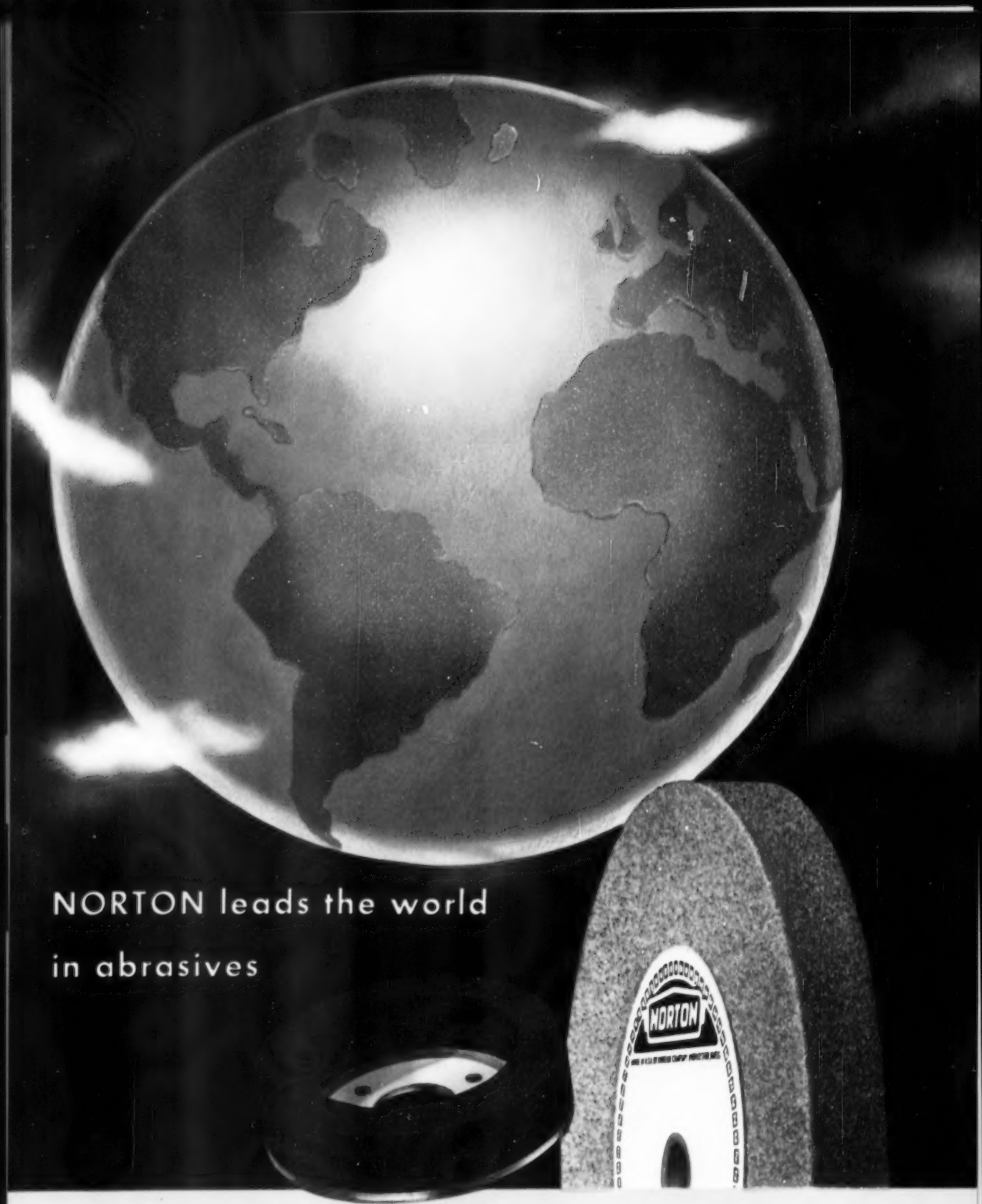

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON BRINGS THE

"TOUCH of GOLD"

TO GRINDING JOBS

THE WORLD OVER

THE TRUE "TOUCH OF GOLD" in grinding can happen only when the grinding wheel — or other abrasive product — is doing the best possible job. That is, when it is saving the most time and money — adding the greatest value to the product being ground — and boosting grinding profits to the maximum. These are the benefits built into all Norton abrasives.

And here are some of the ways in which Norton makes sure you can add the "Touch of Gold" to every grinding job you do . . .

THE BROADEST LINE. Norton offers you the widest choice of abrasive products — available in hundreds of thousands of different grinding combinations, so you will get exactly what you need for best production at lowest cost.

EACH NORTON PRODUCT is manufactured to strictest quality control standards. And each is backed by research and development that have produced the greatest number of abrasive advancements in the field. For example: 32 ALUNDUM* abrasive, unequalled for fast, cool cutting action on today's steels . . . G Bond, most efficient vitrified bond ever developed . . . and NORBIDE boron carbide, hardest material made by man on a commercial production basis.

YOUR NORTON DISTRIBUTOR is ready to help you on any grinding problem. His factory-trained specialist will see that you get exactly the right wheel for each job. And your Norton Abrasive Engineer is always available for expert technical consultation. Take advantage of these application aids to better, more profitable grinding.

FAST SERVICE FROM FULL STOCKS. Norton Distributors, in 268 cities in the U. S. A., maintain stocks fully adequate to the needs of each area. They, in turn are backed-up by warehouse stocks in five major industrial areas, and by the vast stocks in the mile-long Worcester plant. Serving customers abroad are 12 Norton plants and scores of distributors.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

NORTON COMPANY, Worcester 6, Mass.

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BEHR-MANNING, Troy, N. Y. is a division of Norton Company

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STANDARDIZED

UNIVERSAL INDEX PLUNGERS

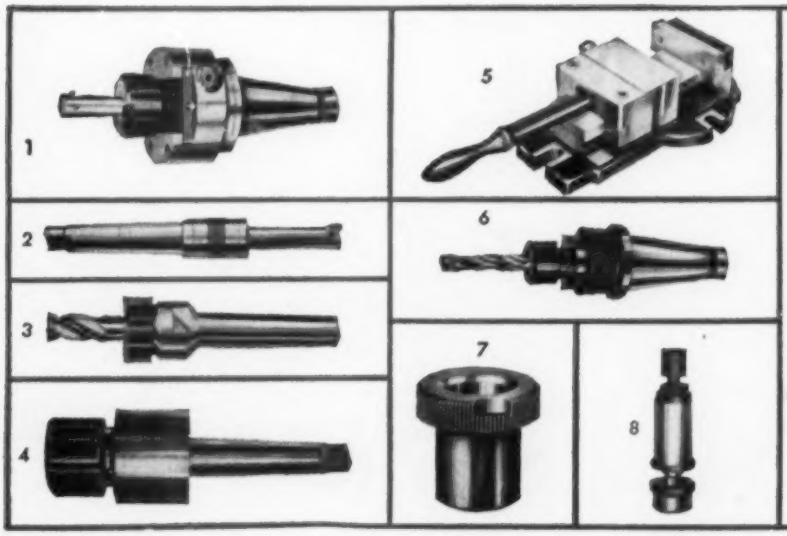
SAVE TIME
SAVE MONEY

Universal's Straight and Taper Plungers made in standard sizes save the time and expense of designing and machining special index plungers for multi-station tools. They come to you complete, ready for installation at approximately ¼ the cost of specially made plungers.

Soft pin knob permits connection to actuating lever or air cylinders by several different methods. Locating bushing, plunger and plunger bushing are hardened and ground.

Plunger is easily assembled from either top or bottom. And it can be removed in either direction by removal of hex nut.

Universal Plungers greatly simplify jig or fixture manufacture because plunger body and bushing have same diameter so that all holes can be bored with same tool, often in same setting.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1
MICHIGAN

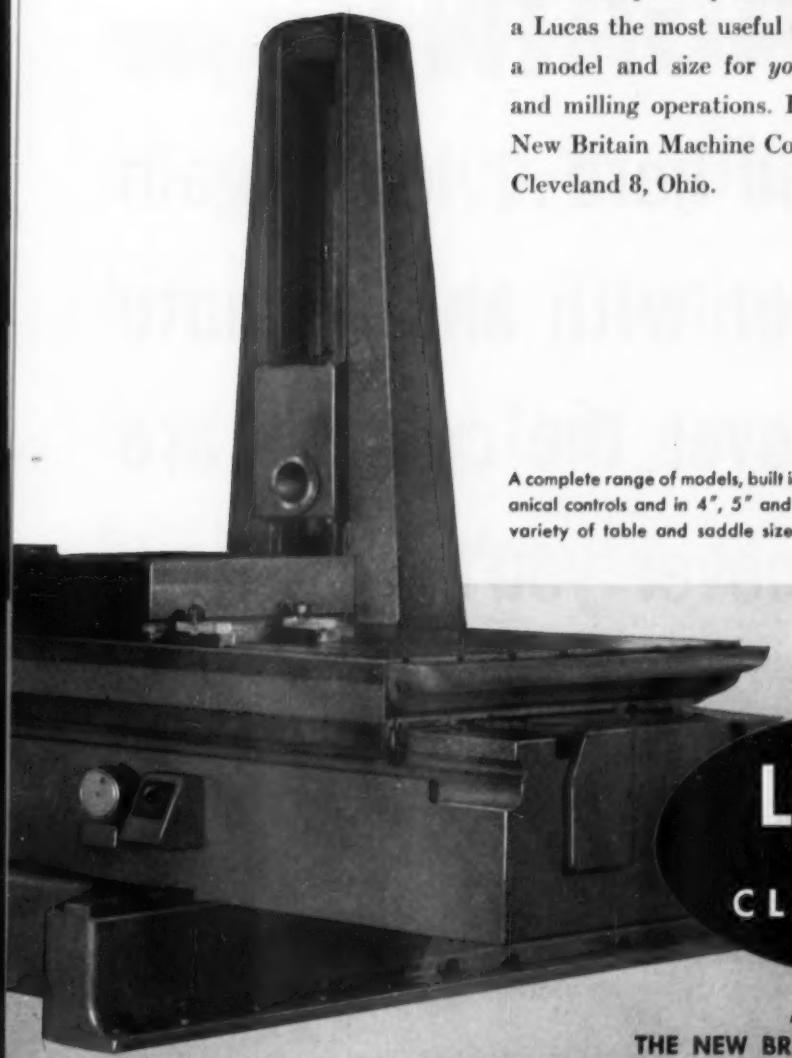
(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

168

Model 6120 Lucas Precision Horizontal
Boring, Drilling and Milling Machine.

"the machine that can do anything"

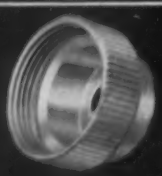
Extreme accuracy, feather-touch pendant control, automatic power positioning for repetitive work make a Lucas the most useful machine in any shop. There's a model and size for *your* horizontal boring, drilling and milling operations. Lucas Machine Division. The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.



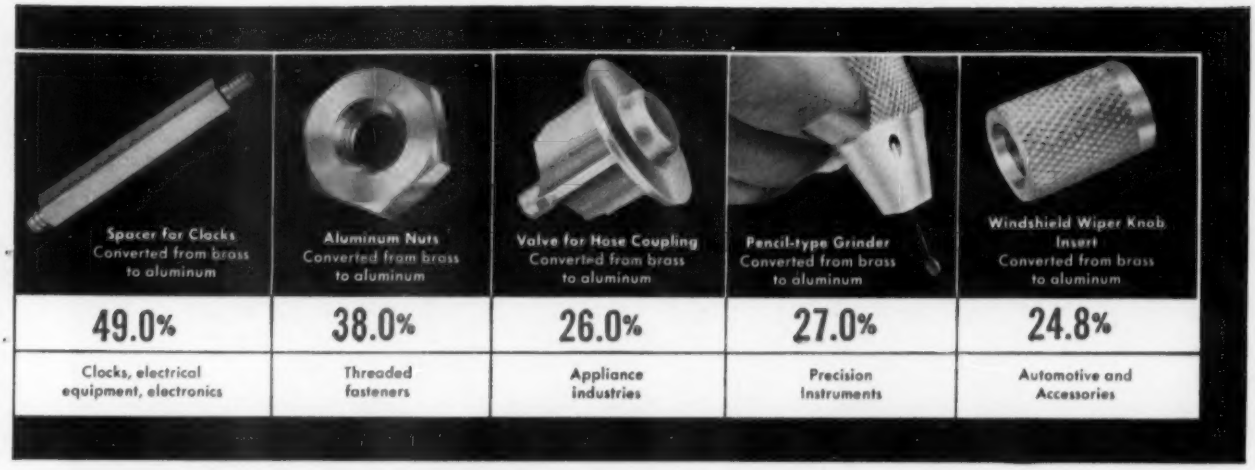
A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two or four-way beds optional.

LUCAS
OF
CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

PART	 Gas Valve Fitting Nut Converted from brass to aluminum	Radio Volume Control Plug Converted from brass to aluminum	Camera Tripod Part Converted from Steel to aluminum	Nozzle Converted from brass to aluminum	Fitting Converted from brass to aluminum
SAVING (based on 1000 parts)	26.9%	35.0%	38.4%	24.9%	44.0%
INDUSTRY	Gas and oil valves, fittings	Radio and television	Cameras, television, movie equipment	Nozzles, Spray equipment	Heating, Air conditioning

LOOK AGAIN! if you industry listed here... look again your customer with an alternate buyers all over the country are ...you'll discover you'll get more



supply screw machine parts for any at savings up to 49% you can offer bid in Kaiser Aluminum . . . parts discovering this amazing economy business because of lower bids in . . .

Kaiser Aluminum

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Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.

He burns the midnight oil for you!

Your local Heller Industrial Supply Distributor is many things . . . counselor and consultant, file expert, business man and friend.

He studies and knows his products and applies that knowledge to your operations . . . is "on call" whenever and wherever you need help or service.

He knows the right type and size file for specific needs.

He keeps you informed of new file developments and applications.

He can deliver, when you want it, any type file from his own stock.

He maintains much larger stocks of files, handles, accessories, hammers and tools than you economically can.

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He literally "burns the midnight oil" for you.

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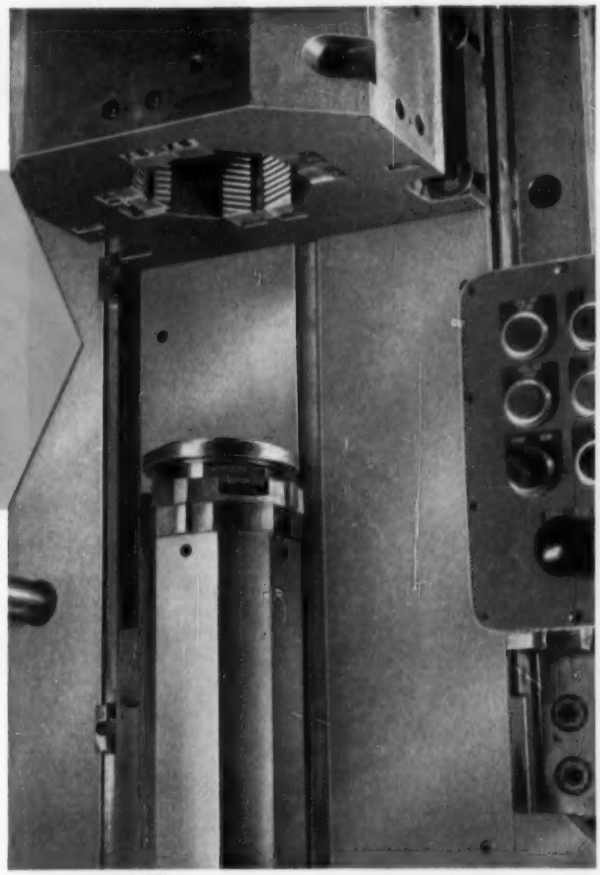
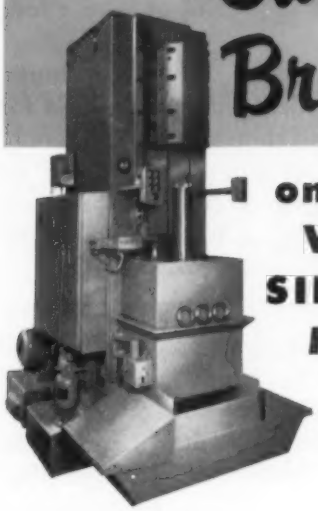
America's oldest file manufacturer

UNUSUAL TOOLING SETUP FOR

External Surface Broaching

on DETROIT VERTICAL SINGLE RAM MACHINE





This broaching job requires rigidity and perfect alignment . . . which makes it a "natural" for the massive Detroit Vertical, built and tooled by experts. Note the safety feature which prevents the main slide from descending until dual push buttons have been operated. This slide holds the heavy, pot-type broach holder in perfect alignment with the fixture post, which is mounted on a fixed knee for even greater accuracy.

Detroit Vertical Single Ram machines are available in standard capacities from 5 to 25 tons, stroke length from 30" to 90". Interchangeable knees with shuttle table mechanism can readily convert this machine into a standard for future production needs. Oversize platens on all standard models allow multiple as well as single station tooling.

Detroit builds every size and type of broaching machine, automates and tools them to fit your needs. Call in a Detroit field engineer, or send us details of your production problem . . . today.

Write for new free bulletin on Detroit Vertical Single Ram Machine

PART—**Automotive transmission component.**

OPERATION—**Broach 4 external lugs, equally spaced.**

TOOLING—**Pot-type broach holder, built in sections for convenient tool assembly . . . in perfect alignment with fixture post.**

CYCLE—**Operator loads work over fixture on top of post, starts machine. Broach holder descends with ram and bottoms after cutting stroke. Operator unloads work and presses palm button for return stroke.**

PRODUCTION—**120 parts per hour.**

MACHINE—**Detroit 10-ton Vertical Single Ram Broaching Machine with 42" stroke and fixed knee.**

DETROIT BROACH & MACHINE COMPANY

DEPARTMENT A-11
ROCHESTER, MICHIGAN

ROCKWELL-BUILT

TWO NEW DELTA

ALL NEW DELTA 15"

World's most versatile drill press for all-around shop use—extra rugged for production work!

WORLD'S MOST COMPLETE LINE—Choose from the world's widest range of models for every production and shop need: floor, bench, multiple-spindle set-ups—production or standard table—plus a complete line of components for adapting to special-purpose operations.

AMAZING VERSATILITY—*Only* Delta gives you a selection of *six* spindle adaptors for dozens of operations. And they're mounted on a ground taper for *complete* accuracy, feature a threaded collar for *positive* locking.

EXCLUSIVE "UNIVERSAL" HAND FEED—*Only* Delta combines the best features of pilot wheel and single lever feeds with an exclusive universal hand feed. Gives you adjustable leverage—freedom from striking table or fixtures—almost infinite choice of feed lever positions.

BUILT FOR PRODUCTION WORK—Spindle has four over-sized, pre-loaded, lubricated-for-life ball bearings for *extra* ruggedness. Big 2" dia. quill and massive one-piece head casting provide greater rigidity. Multiple-spline "floating drive" minimizes vibration, assures smoother operation.

DELTA another product by ROCKWELL

DRILL PRESSES!

GREAT NEW DELTA 20"

Designed for production tooling—
a big-capacity, heavy-duty drill press
that's built to last!

BIG CAPACITY—You get full 6" spindle travel with 5½' high column for additional spindle-to-table capacity. Choose from a complete line: floor, bench, multiple-spindle models—production or standard table—No. 2 or No. 3 Morse Taper Spindle.

RUGGED, ACCURATE—Double row, pre-loaded heavy-duty ball bearing close to the work load eliminates spindle play, assures years of lasting accuracy. Big 3¾" dia. centrifugally cast iron column with ½" thick wall is precision ground to size to give rigid backbone to machine, and extra weight for smooth, efficient operation.

SAFE, SIMPLE OPERATION—Molded, reinforced fibre glass belt guard completely encloses belt and pulleys, swings out of way for fast speed changing. Guard will not dent like steel, crack like iron, rattle like iron or steel. Quick-set depth gage with magnified scale is easy to see, easy to read.

See the great new Delta 15" and 20" Drill presses—compare with any others, *then make up your own mind! Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your phone book.*

Send coupon for all the facts!

Delta Power Tool Division,
Rockwell Manufacturing Co.
618L N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me complete information on new Delta 15" and 20" Drill Presses.

☐ Please send name of my nearest Delta Dealer.

Name _____ Title _____

Company _____

Address _____

City _____ County _____ State _____

TAPS *by* Card

Card taps, world-famous for over 80 years, are quality manufactured to meet your most exacting demands. Specify Taps, Gages and Dies By Card — for accuracy — low cost — top performance.

Presenting the Symbol of Service

YOUR CARD DISTRIBUTOR

The CARD Quality

GAGES *by* Card

S. W. CARD MANUFACTURING CO., Mansfield, Mass. • ***Division of Union Twist Drill Company***

TAPS • DIES • SCREW PLATES • GAGES

For better safer grinding

SIMONDS ABRASIVE CO.

Reinforced Resinoid Bonded ABRASIVE WHEELS

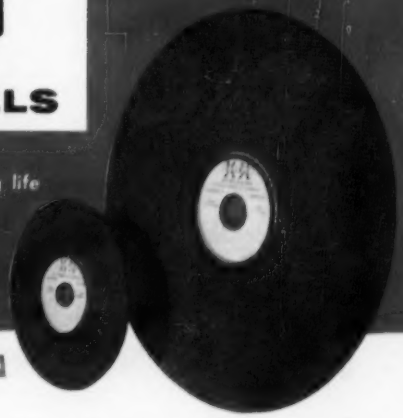
SIMEX® RED WHEEL

Save time and money on weld grinding with SIMEX . . . lightweight, rigid, for heavy duty use. Structurally different—with auto tire cord safety web backing! Send for Bulletin ESA-244.

FIBREX® RED CENTER WHEELS

Ideal for deburring, finishing, polishing and cutting-off. Slightly flexible for general offhand use and the lighter weld grinding jobs. Extra strong and fast cutting. Send for Bulletin ESA-244.

DOUBLE XX CUT-OFF WHEELS



Glass fiber reinforced for extra strength, less breakage and long life
Fast cutting on all types of metals and non-metals.
Send for Bulletin ESA-243.

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

One set-up saves 30%

Photos courtesy of the Kelman Electric & Mfg. Company, Los Angeles, California.

Boring, facing, and high speed drilling with one set-up cut the floor to floor time about one-third on this job.

The Kelman Electric & Mfg. Company say their Cincinnati Super Service Radial Drill "handles easily, is very accurate and versatile."

They are facing 6" diameters; drilling for ½" bottom tap, and tapping with a ½" bottom tap on this job.

The part being processed is a Bronze Top Casting.

Cincinnati Super Service Radial Drills are profit makers in this shop, and they could be in yours.

Write for Bulletin R-21C

CINCINNATI BICKFORD

SUPER C.B. SERVICE

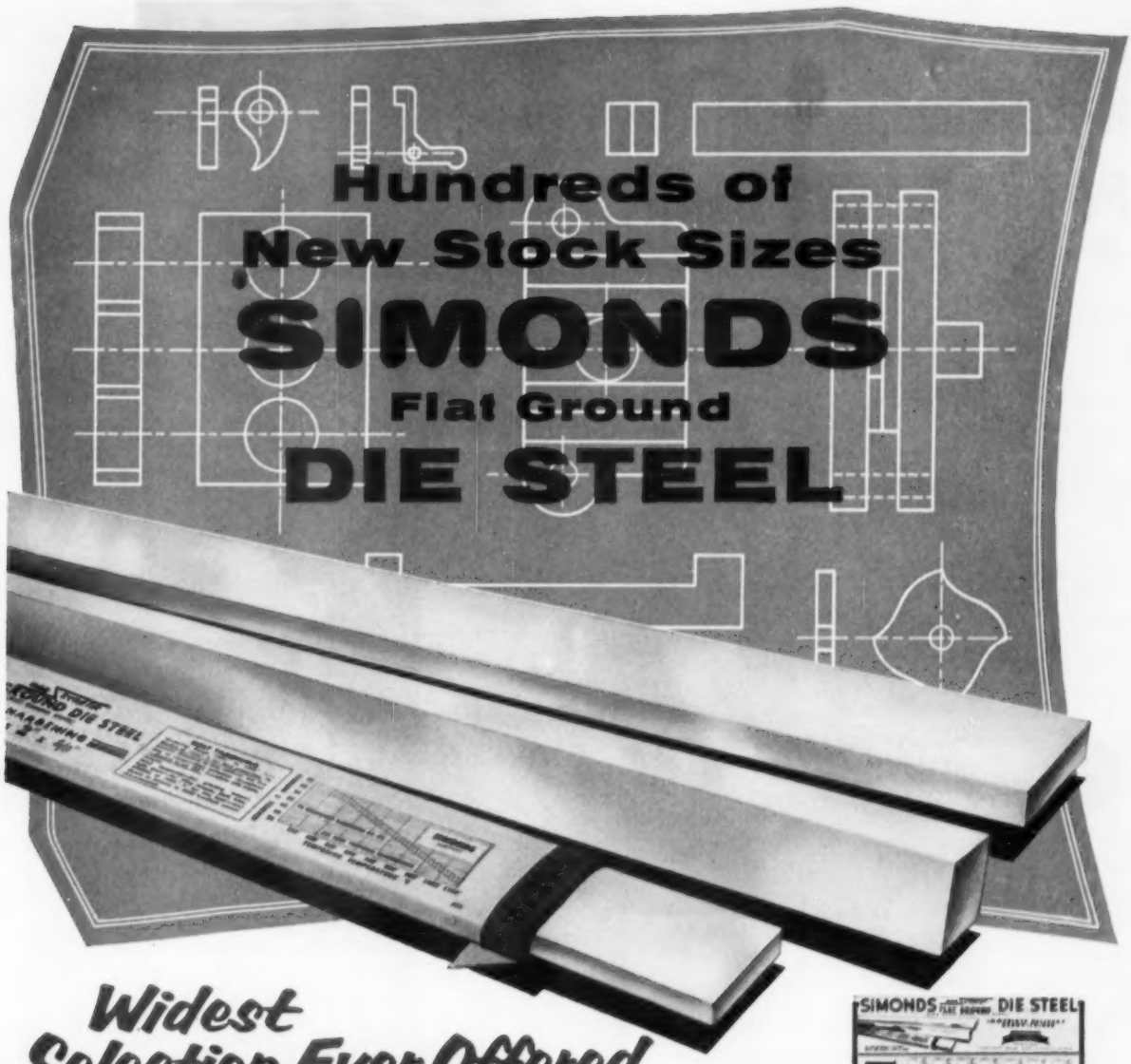
G&L

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.



Widest Selection Ever Offered

Now you can get hundreds of new stock sizes of Simonds high-grade, precision-ground tool and die steel. Sizes that formerly were special are now available from stock at regular prices. Sizes you asked for to help you save time and money. "1001 sizes for 1001 uses" in either OIL or AIR Hardening type steel.

OIL HARDENING TYPE — Non-deforming, spheroidize-annealed for best machinability and consistently uniform hardenability — from Simonds' own steel mill. Extra-smooth finish with all decarburization and surface defects removed. Wide hardening range. Individually packaged (18" and 36" lengths) with simplified heat treating instructions.

AIR HARDENING TYPE — Non-deforming, spheroidize-annealed, 5% chrome — more wear-resistant yet easy to machine and heat treat with uniformly excellent results — another product of Simonds' steel mill. Extra-smooth finish with all decarburization and surface defects removed. Wide hardening range. 36" lengths. Individually packaged with heat treating instructions.

FREE WALL CHART Ask your Simonds Distributor for a copy of this New Chart (18" x 19") giving full range of Stock Sizes now available.

For Fast Service from Complete Stocks

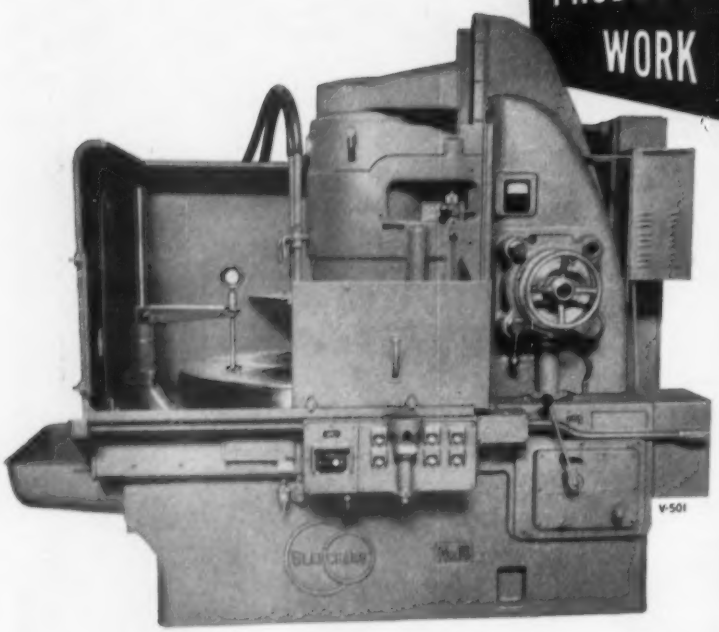
Call your **SIMONDS Industrial Supply DISTRIBUTOR**

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

for BEST results in surface grinding...
PUT IT ON THE BLANCHARD

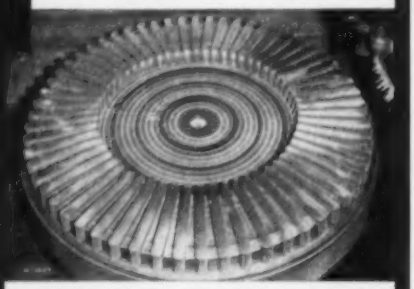
PRODUCTION WORK



Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

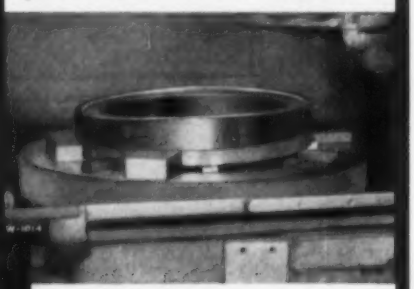
Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.

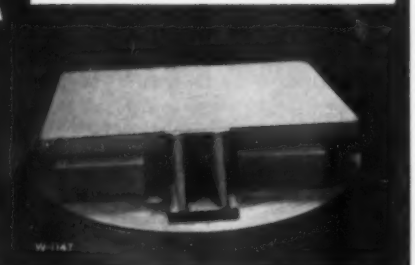


CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.



GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18" x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

PUT IT ON THE BLANCHARD

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Stainless Steel
machining information:

drilling is easy—if you're careful

When you drill chromium-nickel (austenitic) Stainless Steels, use the shallowest punch mark possible. If you punch too deep, there will be a hard spot, and you'll have trouble starting the drill. Most fabricators use a triangular or square-pointed punch for this reason.

High speed, short-twist drills should be used. They should be ground slightly flatter than usual, and with a greater back clearance than you would use for carbon steel. High speed drills are recommended, although for very smooth holes you might try carbon steel drills because you can often put a sharper edge on them.

Be sure that you use enough power and pressure to get a continuous cut; otherwise the drill will ride in the bottom of the hole and work-harden the steel. A backing plate should always be used, because austenitic Stainless Steels will not break out ahead of the drill.

Try step drilling for very deep holes. Keep the drill cool, and always use a cutting compound such as the lard oil-sulfur mixture described on page 58 of our Stainless Steel "Fabrication" book. Don't you have a copy of the book? Just write on your company letterhead to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

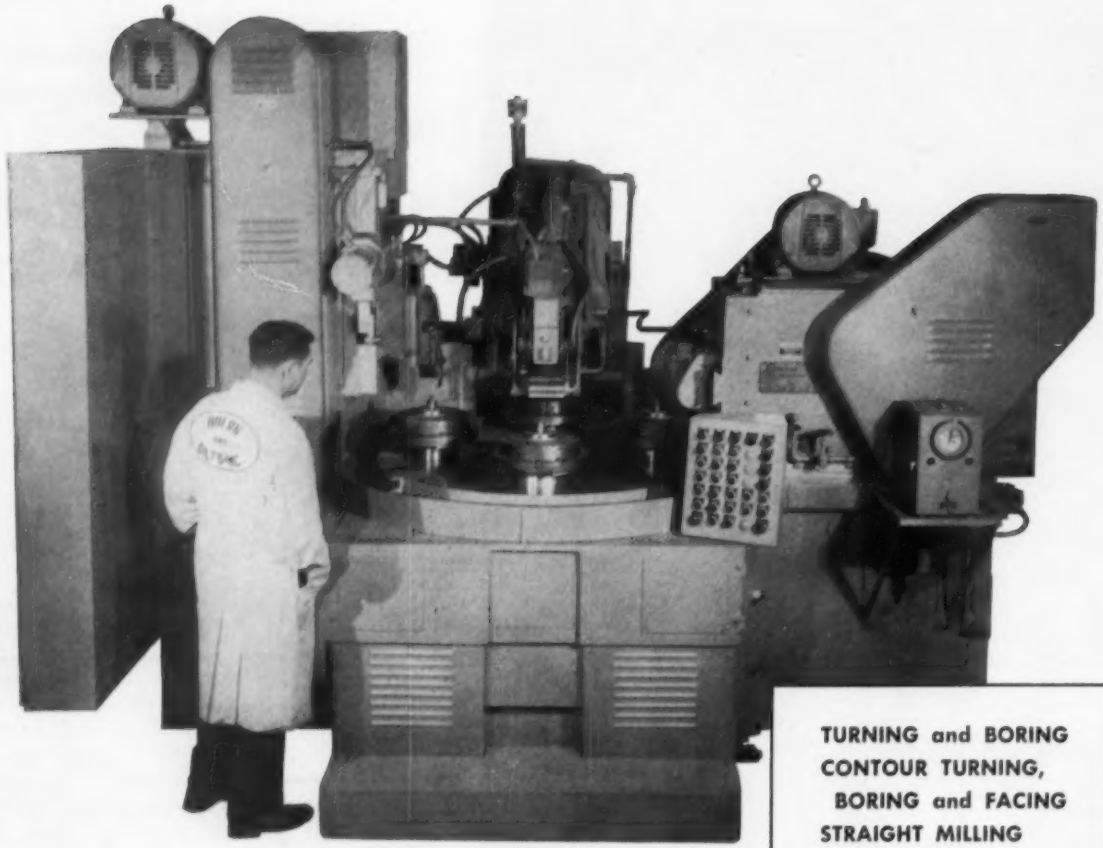
UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL



TURNING and BORING
CONTOUR TURNING, BORING and FACING
STRAIGHT MILLING
CONTOUR MILLING
PLANETARY MILLING
I. D. GRINDING
O. D. GRINDING
SURFACE GRINDING
SURFACE HONING

You can combine these finishing operations on one Hoern & Dilts indexing finishing machine →

Indexing Table: Mounted on pre-loaded roller bearings. Index accurate to .0002". By providing adjacent spindles with proper chucking devices, *both ends* of a piece may be put through identical or closely related operations.

Heads: Individually cam-actuated heads, each designed for a specific type of operation which may be performed vertically or horizontally as required. Heads self-contained, with individual electrical, pneumatic and lubricating systems.

Speeds: One over-all speed may be used, or a different speed at each station. Spindles may be stopped and locked in any predetermined position at any station.

Feeds: Individually adjustable for each head.

Grinding Operations: Wheels dressed and compensated during index.

Automatic Gauging and feedback adjustment available at all stations.

A Hoern & Dilts Indexing Finishing Machine handles with *one* chucking and one operator, the operations ordinarily performed by several operators using completely different types of equipment.

This advanced approach to increased, more accurate production is accomplished by arranging a variety of self-contained heads around a central indexing table in which the spindles are mounted. Since all the operations are performed with a single chucking, all the proper relationships are maintained.

Hoern & Dilts engineers will welcome the opportunity to cooperate with you on any high production finishing operation.

HOERN & DILTS DIVISION

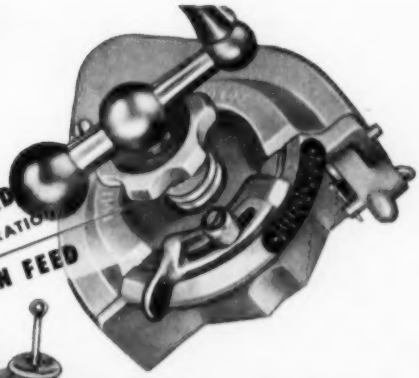
The New Britain Machine Company
Saginaw, Michigan

OTHER NEW BRITAIN MACHINE TOOL DIVISIONS:

New Britain-Gridley Machine Division
New Britain, Connecticut
Automatic Bar and Chucking Machines
Precision Boring Machines and
New Britain +GF+ Turning Lathes

Lucas Machine Division
Cleveland, Ohio
Precision Horizontal Boring, Drilling and Milling Machines

ever see a METAL SAW that thinks for itself?



MARVEL SAWS' Automatic "Brain" Adjusts Blade Feed Pressure and Depth on Every Stroke to

GIVE YOU FASTER CUTTING-OFF

The exclusive automatic Dual Power Feed built into every MARVEL Series 6 and 9 Hack Saw is the "brain" that adjusts and compensates both pressure and depth of feed correctly in proportion to the number of blade teeth in contact with the work. Once the MARVEL Dual Feed is set, no operator attention is required to insure that the blade is cutting as deeply as possible and practical on every stroke . . . regardless of the changing area of the work being cut. Whether the Saw is being used for continuous automatic cut-off of identical pieces or a single cut, the MARVEL Dual Feed that practically "thinks for itself" guarantees that the work is cut-off in the fewest possible number of strokes.

Heavy duty MARVEL Series 6 and 9 Hack Saws embody every practical design and operating feature to give you speed, accuracy and operating economy you can find in no other metal cutting saws.

Write for the MARVEL Catalog and complete details on MARVEL Saws

S-1304

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

Metal Cutting MARVEL SAWS
Better Machines–Better Blades

GENERAL ELECTRIC ANNOUNCES

static switching systems

General Electric's new static switching systems have been designed to increase significantly the dependability and life of control equipment where frequent operations, complex systems, and continuous processes are required or atmospheric problems exist.

These new G-E systems utilize static-magnetic and solid-state devices to perform a variety of control functions normally accomplished by contact-making devices. Static switching systems consist of varied combinations of seven basic units: an isolation switch unit, two multi-purpose units, a long time-delay unit, a short time-delay unit, an "AND" unit, and an "OR" unit. These units can also be combined with static power supplies, static amplifiers, and static regulators to provide completely static control systems.

Where frequent operations are involved, static switching systems are ideal, as they have no moving parts to wear.

Where complex control functions are required, the simplified circuitry of the static switching systems makes them particularly applicable.

For continuous processes, these systems assure dependability through the use of pre-tested, industry-proved static components.

Unaffected by most atmospheric conditions, the static units are encapsulated in an inert, lightweight compound.

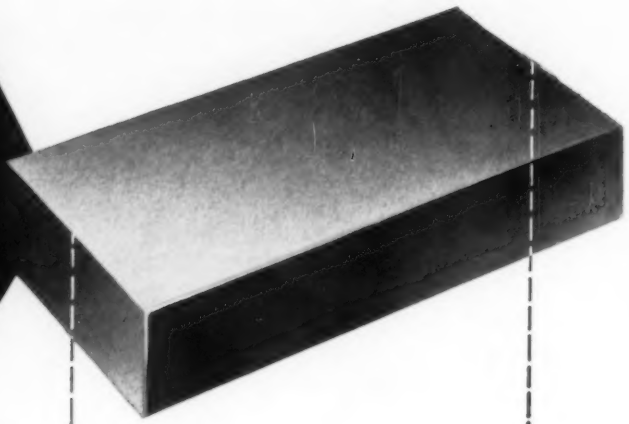
General Electric control engineers are ready now to help you apply the benefits of static switching systems to your machines or processes. For additional information, contact your nearest General Electric Apparatus Sales Office, or write for Bulletin GEA-6364 to Sect. 785-2, General Electric Co., Schenectady 5, New York. *Industry Control Dept., Roanoke, Virginia.*

Progress Is Our Most Important Product

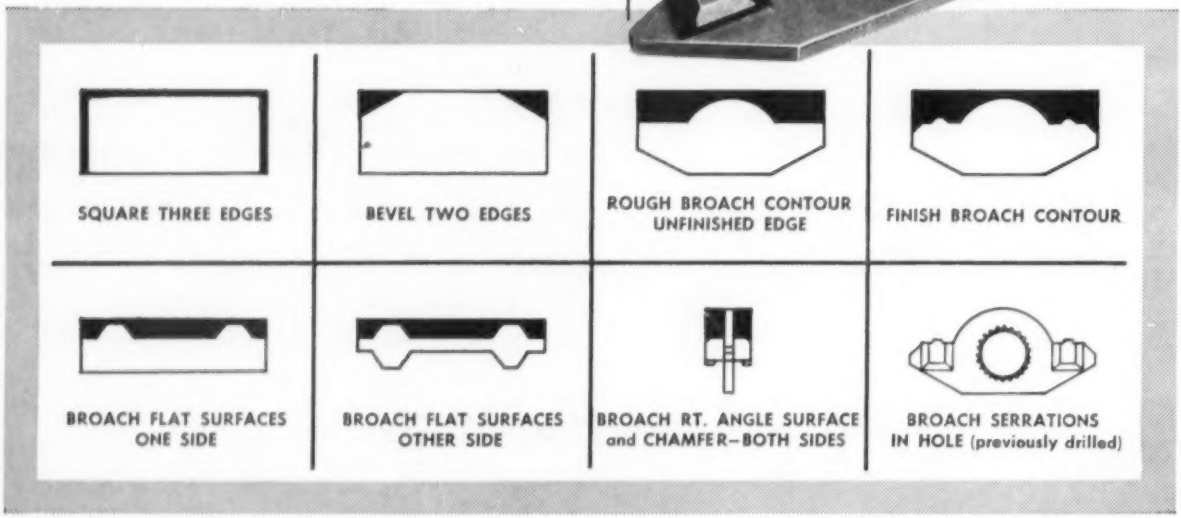
GENERAL ELECTRIC

CAT. NO

ROCKER ARM
machined from bar stock
in 8
BROACHING OPERATIONS



Broaching's all-round versatility is illustrated by this unusual adaptation of a standard American 3-Way broaching machine for the production of finished rocker arm part from bar stock. The eight broaching operations are shown in sequence below.


SQUARE THREE EDGES
BEVEL TWO EDGES
ROUGH BROACH CONTOUR UNFINISHED EDGE
FINISH BROACH CONTOUR
BROACH FLAT SURFACES ONE SIDE
BROACH FLAT SURFACES OTHER SIDE
BROACH RT. ANGLE SURFACE and CHAMFER–BOTH SIDES
BROACH SERRATIONS IN HOLE (previously drilled)

Small quantity production of this rocker arm part, plus a requirement that all surfaces be finished, made a forging impractical. Broaching gave the desired finish and confined the operations to one machine so that holding and locating fixtures were simplified.

American designed and built the broaches and had previously supplied the 3-Way vertical hydraulic broaching machine. But to American's good customer, The American Tool Co., Kalamazoo, Mich., goes the credit for the ingenuity displayed in developing the operation and building the interchangeable fixtures.

Whether you require eight operations on few parts, or one operation on thousands, the versatility of American broaches, fixtures and broaching machines can mean gains in your output, cuts in your costs. Give American the details; you'll receive a prompt recommendation.

ASK FOR CATALOG 450

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

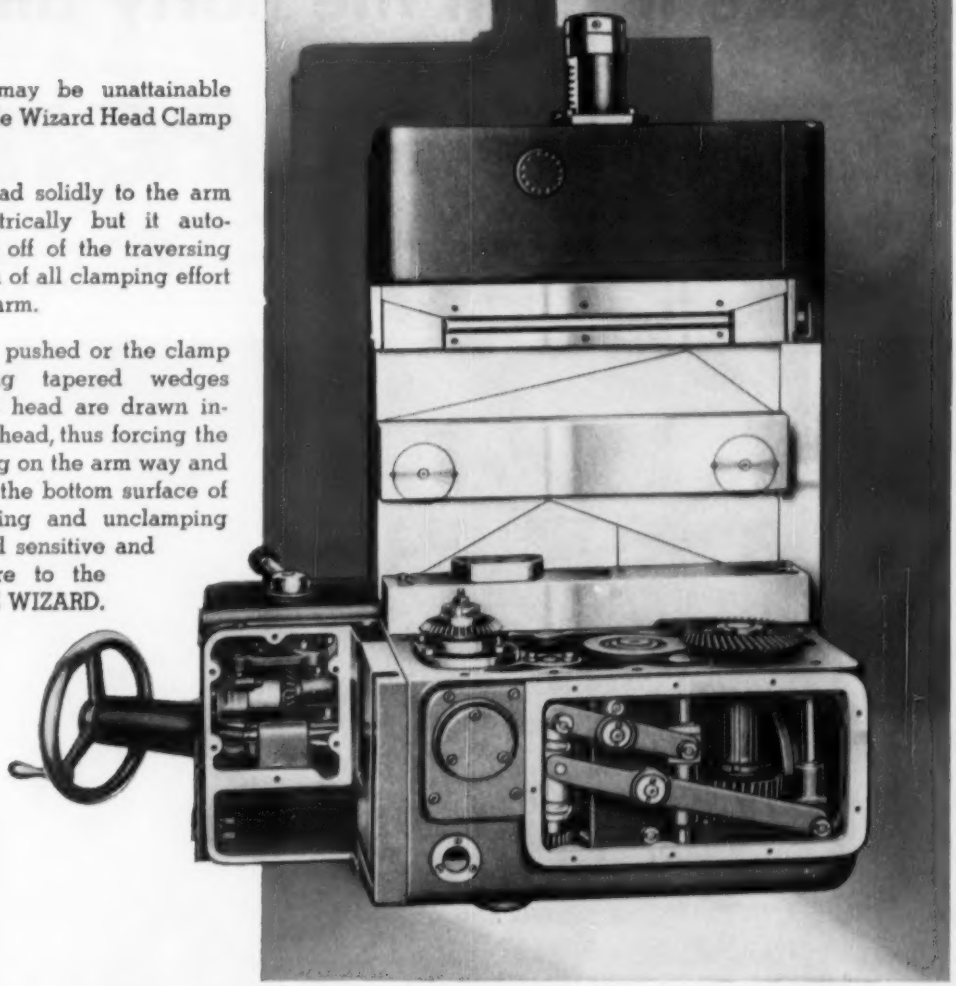
See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

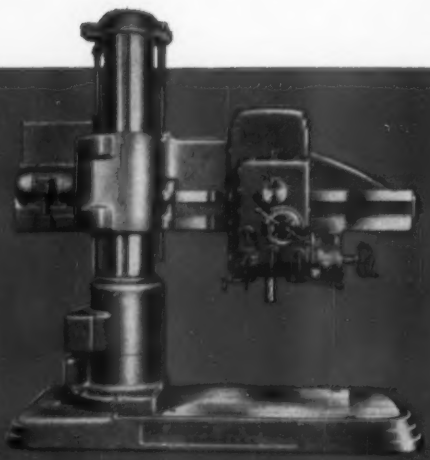
Clamping Perfection

Theoretically perfection may be unattainable but practically the new Hole Wizard Head Clamp is perfect.

It not only clamps the head solidly to the arm either manually or electrically but it automatically raises the head off of the traversing rollers, thus relieving them of all clamping effort and binds it solidly to the arm.

When the clamp button is pushed or the clamp lever actuated, opposing tapered wedges between the arm and the head are drawn inwardly at each side of the head, thus forcing the head off of its roller bearing on the arm way and wedging it solidly against the bottom surface of of the arm. This clamping and unclamping action is instantaneous and sensitive and adds another plus feature to the "AMERICAN" NEW HOLE WIZARD.





Plus features

Speaking of Plus Features here are a few you will want in your next radial.

- Centralized Control.
- Lightning-fast Direct Reading Speed Change.
- Nitrided Spindle and Sleeve—practically wear proof.
- Timken mounted column unit defies deflection.
- Raybestos covered, spring steel tapping attachment friction bands, quick acting, wear proof, permitting 40% speed-up for spindle reverse.

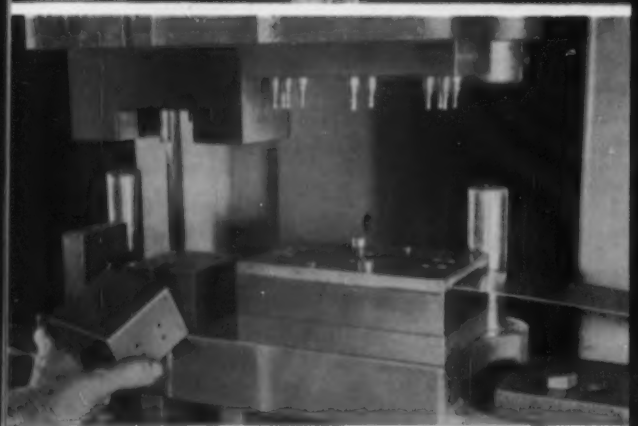
These are just a few . . .
learn the others from bulletin No. 328

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Take it from the early birds...

"IT'S THE GREATEST



Niagara Series E 4½ OBI Press in operation at a well known eastern commercial stamping plant. Work includes stamping small wrenches; trimming canopies for electrical fixtures; piercing, cutting off and forming saddles with a progressive die (shown).

Niagara Series E 4½ OBI Press engaged in blanking and drawing of kitchen cannister lids from half-hard aluminum at midwestern housewares manufacturing plant.

"we can produce from 8,000 to 10,000 pieces in an eight hour day"

"much safer press"

"takes less floor space"

"has a centralized pressure lubricator which we like very much"

O.B.I. EVER BUILT"

"we find that dies without posts work much better on this press"

"all dies give better and longer runs"

"large slide area for large trimming, blanking and progressive dies"

Niagara Series E 5½ OBI Press forming and trimming hemispherical copper parts for one of the "Big Two" electrical manufacturers.

Few developments in metalworking history have drawn the enthusiastic endorsement given Niagara's revolutionary Front-to-Back Crankshaft OBI Press.

Now, as at the 1955 Machine Tool Show where it was unveiled, there is *nothing* even remotely resembling it in the industry... design-wise and production-wise.

Customers in U.S. and Canada... the "early birds" who are doing their modernizing with the most modern press of all... can today tell you about accomplishments with this newest and greatest of OBIs that you would have never dreamed possible. Yes, the press that Niagara conceived to do more than any OBI ever built is doing just that for a fast-growing list of metalworking plants.

There's a huge fund of successful experiences that a Niagara representative can share with you today. Draw on it now and utilize it in your modernization plans. Make a date, at your convenience, for a personal call.

...and if you haven't received new Bulletin 56 with complete design description and specifications (75-200 ton capacities, 4½-7½ inch shaft diameters, standard and automated models) write for your copy at once. You will find it invaluable to your planning.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.Y.

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America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

NIAGARA

front-to-back crankshaft INCLINABLE PRESSES

Now...a low-priced heavy-duty soluble oil, with active germicide and E. P. base oil additives!

Read what leading metalworking plants say about Stuart's

DASCO D-20*

Turret lathes—Tool life doubled, machining 4620 steel forgings; rancidity and rust eliminated.

Reaming—No rancidity after 7 weeks; tool life increased from 10 to 15 pieces per grind; better finish; no rancidity.

Drilling—Well over 100 per cent increase in tool life.

Turning, boring, facing, chamfering, drilling, tapping, and milling—Stays cleaner; no foaming; better emulsion; better tool life.

Turning, reaming, tapping, and threading—Immediate improvement in finish; 50 per cent boost in life of all tools.

Broaching—Vast improvement in finish and tool life broaching internal gear teeth, at 30 to 1 dilution.

Carbides—Excellent tool life; no rancidity.

General-purpose—Saving $7200 per month by using in 365 different machines; rancidity eliminated.

Turret lathes—Coolant life extended to six weeks, with no rancidity or rust; now using as general-purpose cutting oil.

Turret lathes—Doubled number of parts per tool grind.

Surface grinders—Superior finish; good wheel life; no rusting or obnoxious odors.

Turret lathes—Saves money because performance is equal to, or better than, that of oils costing half again as much.

Tapping—Increased pieces per grind from 250 to 1800, tapping tough steel forgings.

Threading—Producing 60 more forgings per set of chasers; no rancidity.

Stuart Proved on job after job!

DASCO D-20*

Exclusive new formula brings you better performance...cutting or grinding!

Stuart's Dasco D-20 drastically reduces the number of different cutting fluids needed in your plant—maintains or upgrades performance of your machines and cutting tools! For wide application on many different operations not requiring highly developed water-mix grinding and cutting fluids like Stuart's Codol or Stuart's Solvol, this new low-cost water-mixture has an E.P. base oil additive that provides high anti-weld and lubricity characteristics, plus superior wetting ability.

IMPROVES PERFORMANCE OF YOUR MACHINES AND CUTTING TOOLS—You get longer tool life because Stuart's Dasco D-20 reduces friction and heat, effectively stops welding. Superior wetting ability takes heat away fast. Finish and accuracy are improved because there's no build-up on cutting edges. Fine chips settle fast on your fine-finish grinding jobs.

SAVES MAINTENANCE AND CUTTING OIL COSTS, NOTHING ELSE TO ADD—Gives you many advantages of a heavy-duty soluble oil, yet costs less than most general-purpose compounds. Price includes special active germicide, the best of a very few that are effective in the presence of soaps. Properly mixed and used in a clean machine, it's a highly stable emulsion which stays in use longer and remains sweet, even after long shutdowns. There's no rusting or gumming of chucks, fixtures, or parts. Operators like it because the germicidal agent is bland and absolutely harmless, even to the most sensitive skin.

These and other cost-cutting benefits are the result of careful, experienced formulation by Stuart . . . the company that pioneered heavy-duty soluble oils more than 15 years ago.

*SAME AS NPD-D-20

Phone your Stuart Service Center

Arrange now to test Stuart's Dasco D-20 on your difficult cutting and grinding jobs.

DETROIT, MICH.....Tyler 7-8500
CHICAGO, ILL.....Bishop 7-7100
HARTFORD, CONN.....Jackson 7-1144
CLEVELAND, OHIO.....Prospect 1-7411
PHILADELPHIA, PA.....Devonshire 8-6100
TORONTO, CANADA.....Oxford 9-9397

Representatives in all principal cities

SINCE 1865

D. A. STUART OIL CO., Limited

2729 South Troy Street, Chicago 23, Illinois

CANADIAN D. A. STUART OIL CO., LIMITED

3575 Danforth Avenue, Toronto 13, Ontario

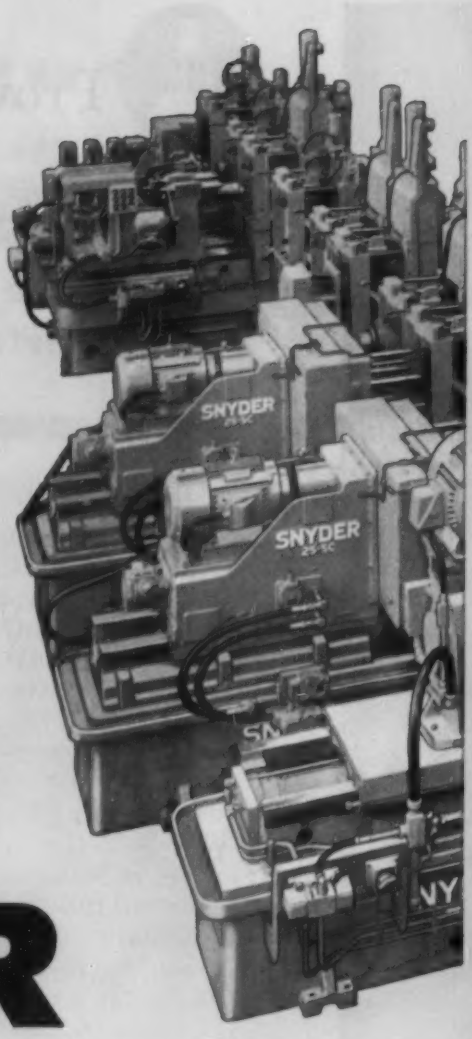
Stuart

METALWORKING LUBRICANTS

UNIQUE FEATURES IN SNYDER 9-SEGMENT, 24-STATION, IN-LINE AUTOMATED TRANSFER MACHINE

for processing converter housings; independent control panels permit individual segment operation (co-ordinated with master panel); electric circuits can be individually checked by Circuit-Sleuth Panel; at Station 4, workpiece is re-oriented 90°; at Station 21, two dowel holes and one transmission hole are precision bored to .001 in size; at Station 22 these holes are automatically precision air gaged.

Workpiece reaches machine finish ground on both faces; machine performs 59 operations, delivers workpiece completed and automatically inspected. Production, 128 pieces an hour at 100% efficiency.

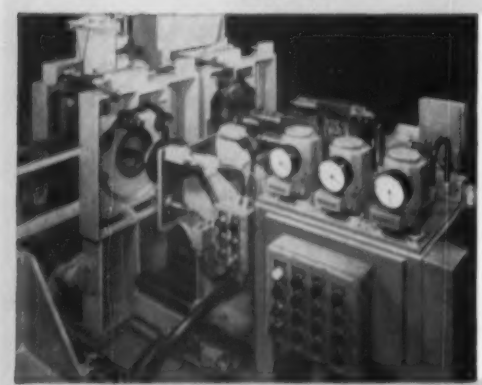


SNYDER

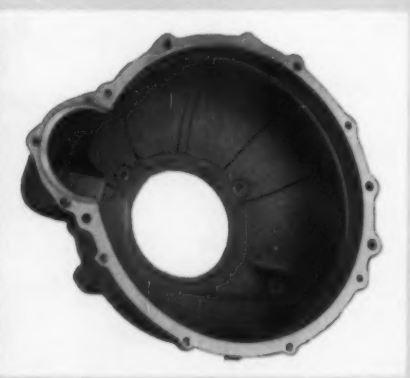
TOOL & ENGINEERING COMPANY

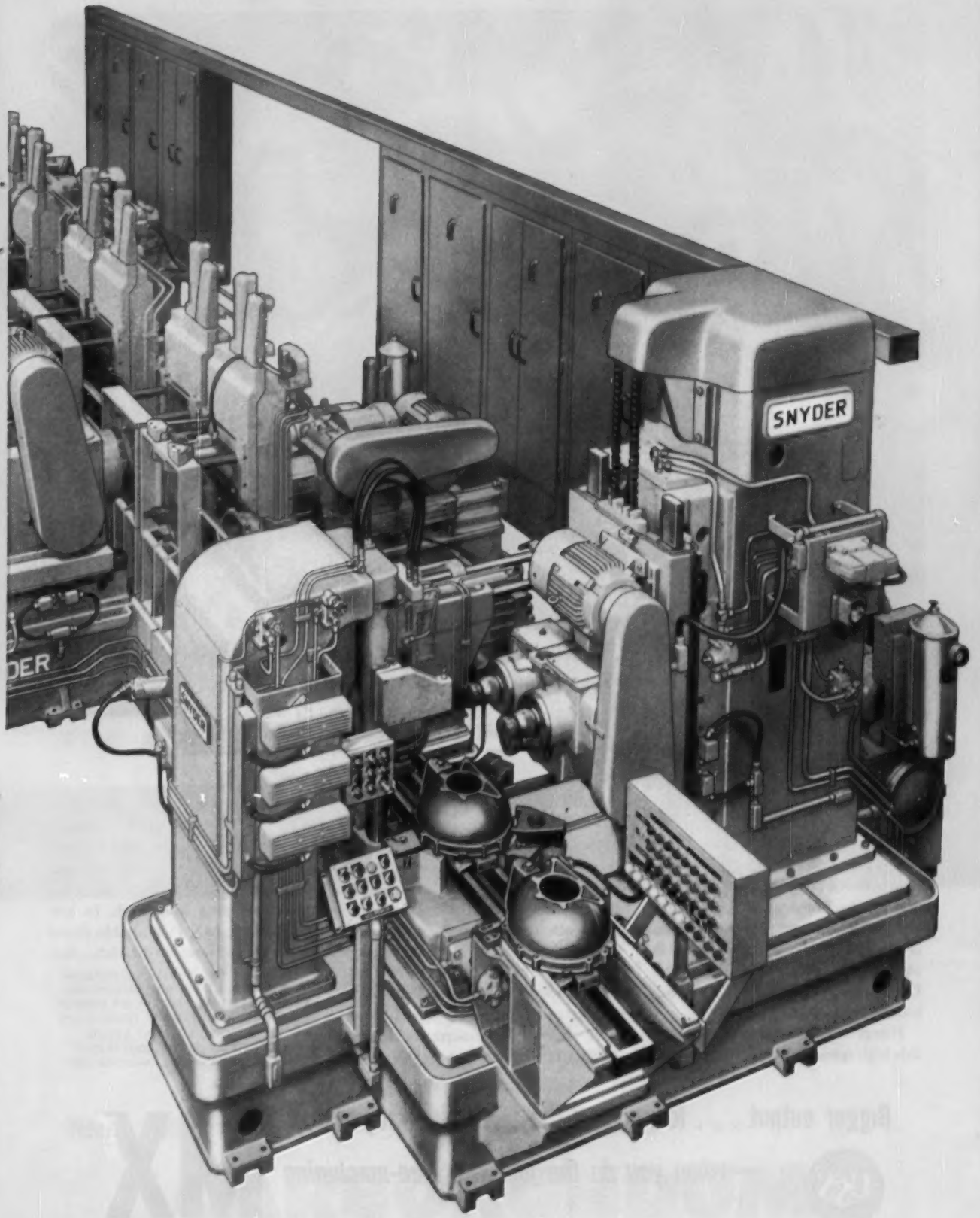
3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

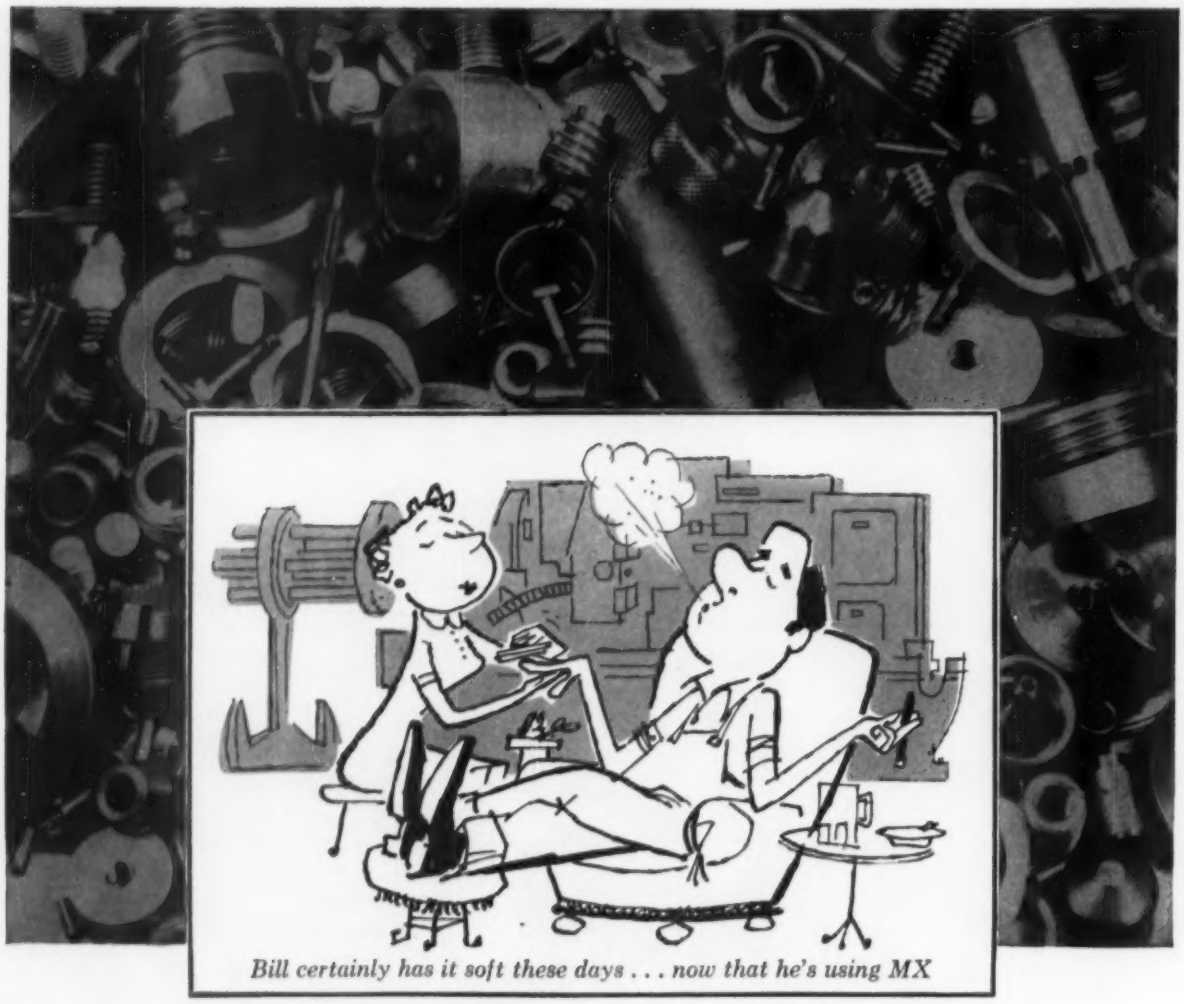
31 Years of Special Machine Tools with Automation



Boring and air gaging stations.




SNYDER



Bill certainly has it soft these days . . . now that he's using MX

Life can be beautiful!

When parts are coming off the machine faster than ever before—when your tools are lasting up to twice as long between grindings—when you're getting clean, sharp, accurate finish right along—when your production is up and your costs are down—in other words, when you're running on USS Free-Machining MX, life can indeed be beautiful.

Hundreds of shops that have put this high speed, fast cutting bar stock to work in the past five years have proved this to be true. And, almost without exception, *cost savings* have been recorded. That's because MX, despite its better performance, actually costs no more than ordinary screw stock. So when you get more parts per hour, with fewer rejects and less tool grinding, such cost reductions are *clear* savings. These savings have averaged between 10 and 15%—have sometimes run as high as 40% or better.

Prove this for yourself. Switch to MX. Produced in all the popular screw stock sizes, it is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trademark. In hot-rolled form, MX is available direct through our nearest district office.

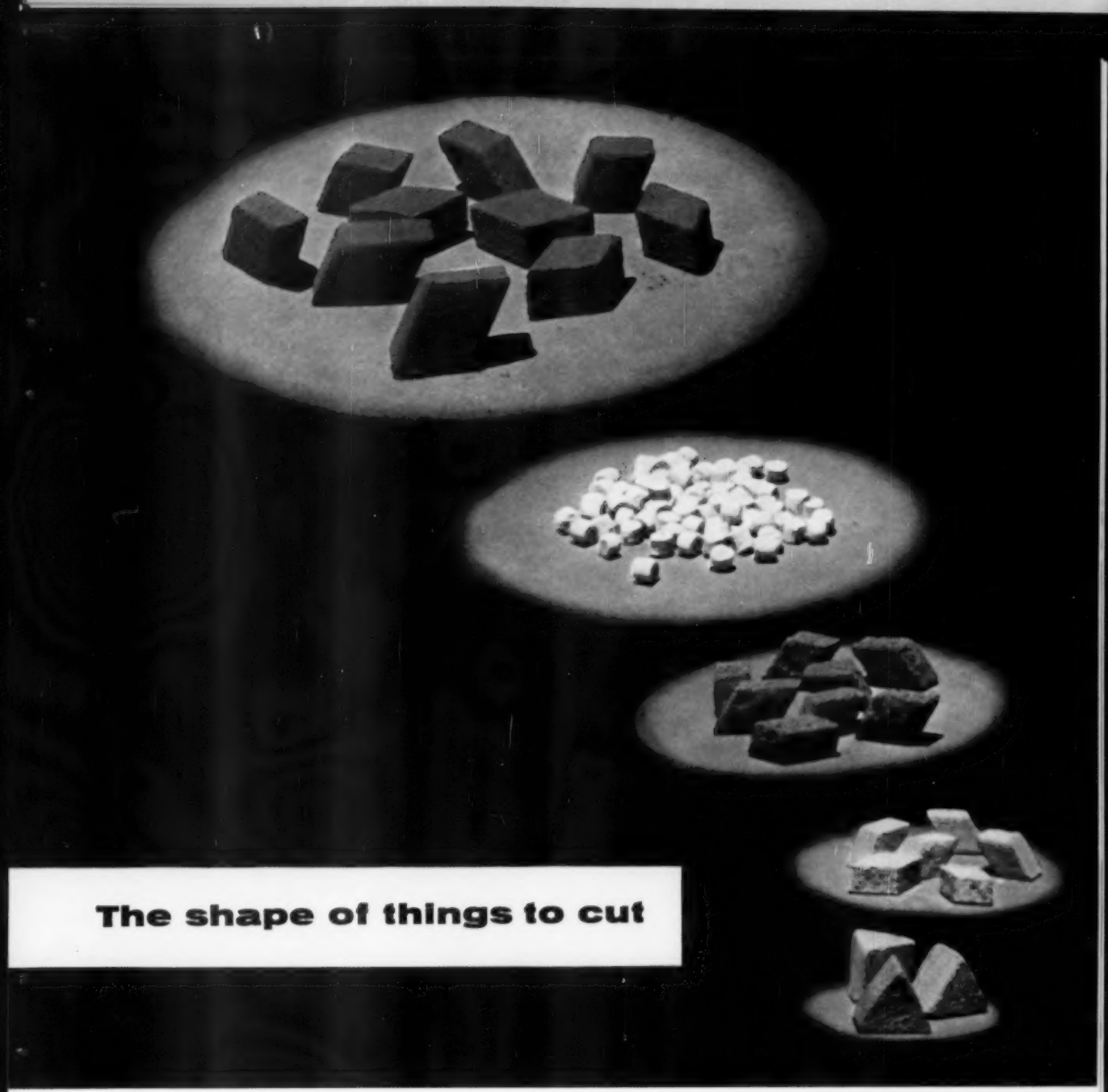
UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output . . . longer tool life . . . fewer rejects

USS

—when you do the job with free-machining **MX**

UNITED STATES STEEL



The shape of things to cut

Here's the most exciting development in abrasive tumbling since the invention of the tumbling barrel... *Bonded* Nuggets by CARBORUNDUM. These nuggets are available in specific shapes — meeting all present-day requirements. Thanks to controlled and absolute uniformity of shape and size, Bonded Nuggets assure unmatched control in your tumbling operations, with predictable performance on every job. These Bonded Nuggets lend themselves to loose grain additives which are frequently introduced for increased and better performance. On any tumbling job you have, you'd do well to consult your CARBORUNDUM Distributor or salesman for up-to-the-minute information on abrasives and techniques. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

PHOTOGRAPHED AT DETROIT PRODUCTIVE PARTS, CLAWSON, MICH.

You get right to the meat of your centerless grinding problem when you specify wheels by CARBORUNDUM. Each is designed and built with the *one* combination of abrasive grain and bond to perform your specific job best. Regulating wheels, too, are job-engineered at CARBORUNDUM.

For instance, a special resilient-center regulating wheel, developed for armature grinding and similar work, eliminates the grinding pressures and faulty finish created by conventional feed wheels. *You* can benefit from this outstanding leadership in centerless grinding.

Call in your CARBORUNDUM Distributor or salesman today—to survey your operations and recommend the wheels you need. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

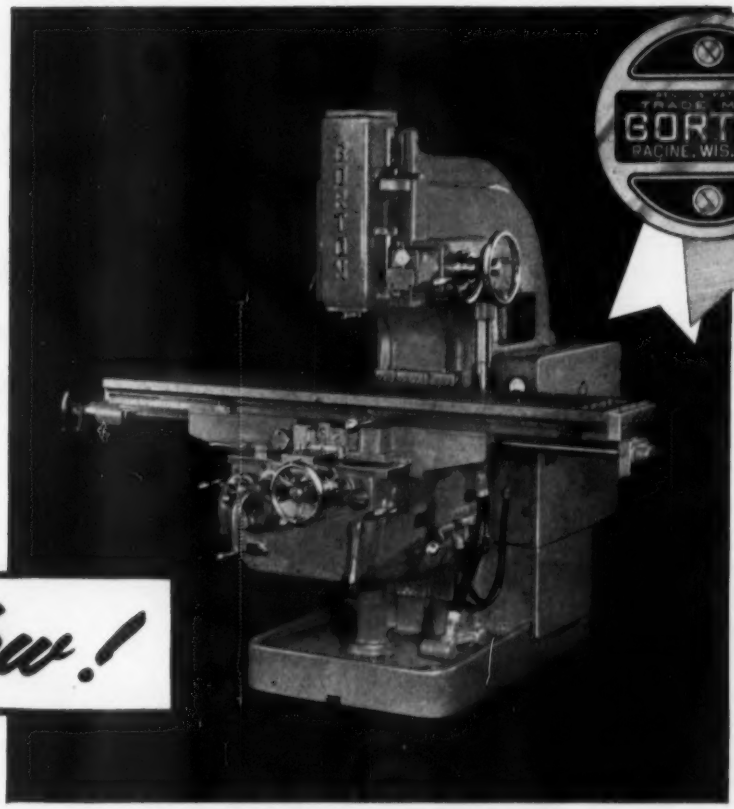
Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

GORTON PRESENTS A *Winner!*



NEW GORTON 3-48 VERTICAL MILL

Compare These Features **with any No. 4 Milling Machine**

- Designed for high-speed and carbide milling
- 76-inch table; 48-inch table travel
- 46-inch saddle with hardened wear plates at each end
- 24½-inch Fullwidth knee
- 15/7½ H.P. spindle motor — drives spindle only
- 5 H.P. feed motor
- 36 speeds; 25 to 2,000 R.P.M.
- 3 Feed Ranges available
- Square-Lock bearing guides with long length-to-width ratio
- Dial-type horsepower load meter
- Interchangeable Assembly unit construction
- 100% mechanical and electrical overload protection
- Removable coolant pan for easy clean-out

Above features also available in Horizontal and Universal models.

Write for Catalog 2585, which describes 3-48 Vertical Mills, and 1511-1655 Gorton General Catalog.

GORTON

GEORGE GORTON MACHINE CO.

1511 Racine St. • Racine, Wis., U.S.A. 56-3

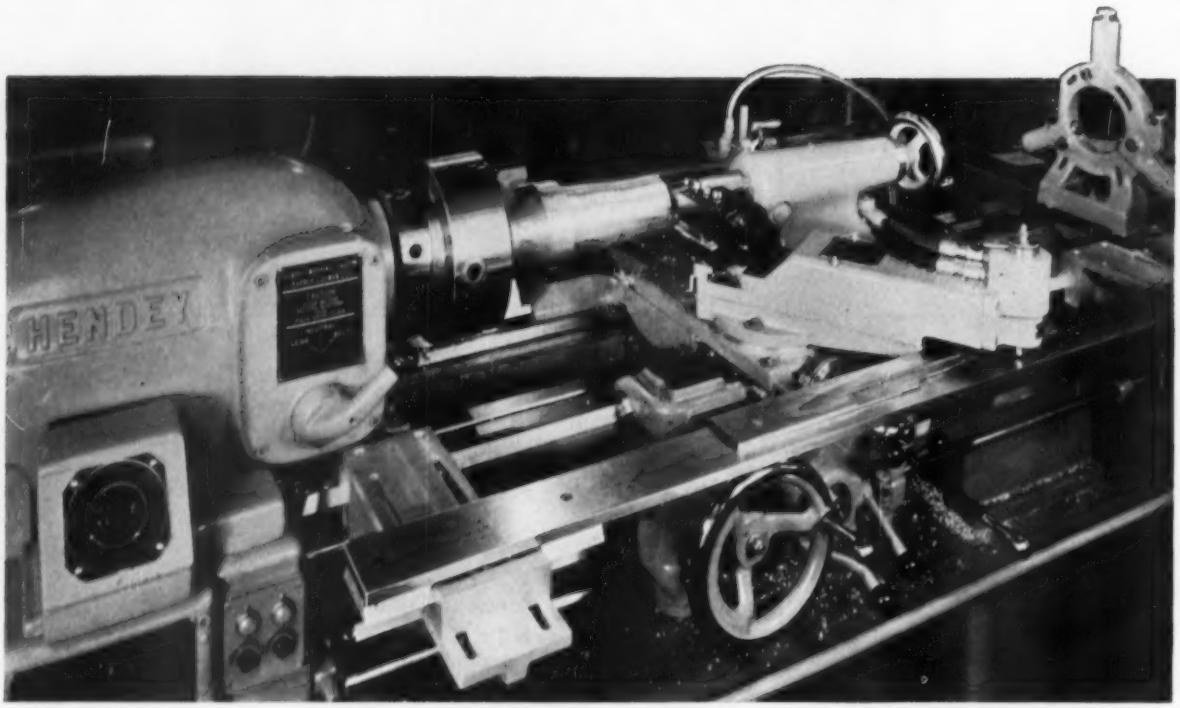
SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A 8736-1P

new tracer control

TO *Hendey* NO. 2E

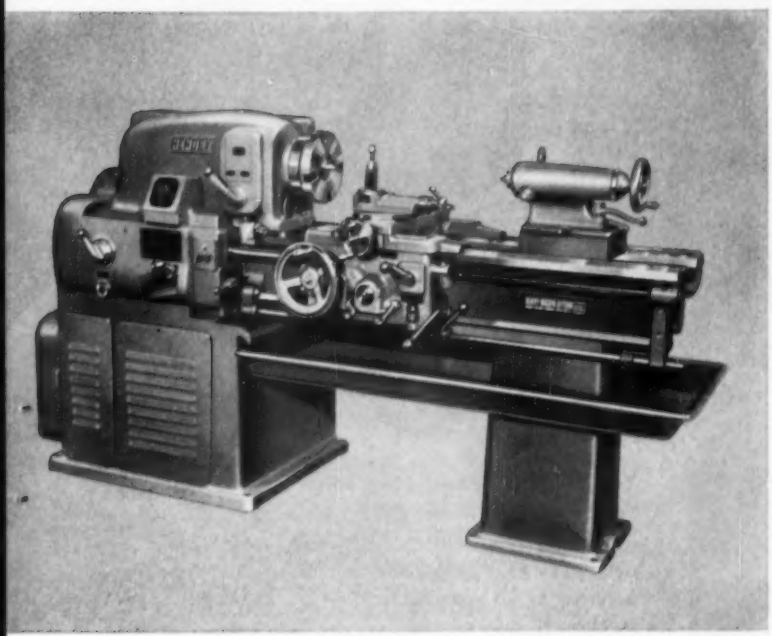


Already known as the multi-feature lathe, the Hendey No. 2E now offers a hydraulic tracer for production turning jobs. Available as optional equipment, the packaged-unit tracer attachment doesn't require drilling any holes for mounting, it simply replaces the standard compound. Mounting brackets for holding the flat template are fastened quickly with two bolts. Whenever three or more pieces are to be step-turned, a tracer-equipped Hendey No. 2E can do the job with unmatched economy and requires only a few minutes' setup time. The close tolerances and fine finishes you get reduce, or in many cases eliminate, additional finishing operations.

This tracer-controlled lathe with infinitely variable speed is in the moderate price class. Contact your Hendey dealer for details and specifications.

ADDS EARNING POWER

GENERAL PURPOSE LATHE



Right Turning Speed for Every Job

Hendey stepless speed control makes an ideal combination with the hydraulic tracer . . . fingertip control permits smooth speed changes even while spindle is under load . . . dynamic braking means faster stopping and reversing of spindle . . . all design features are tailored to give you lowest cost per piece produced with a minimum capital investment.

General Purpose Lathe No. 2E, 14 in.

With tracer removed you have an outstanding general purpose lathe for precision turning in toolroom or shop . . . spindle speeds infinitely variable from 15 to 1500 rpm . . . belt drive for smooth, vibration-free performance . . . preloaded precision spindle bearings insure accuracy . . . alloy cast iron bed ways induction-hardened and ground for long life.

for precision with production, buy Hendey

Hendey machine division
BARBER-COLMAN COMPANY
111 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

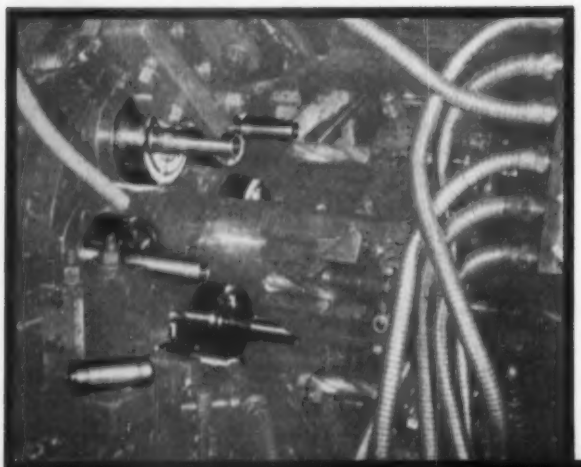
HARDINGE

When Ordering Automatics

Specify **HARDINGE Style "S" Sure-Grip Master Collets and Pads**

and **HARDINGE Style "B" Master Feed Fingers and Pads**

Photo of Model 601 New Britain Automatic courtesy New Britain-Gridley Machine Division.



Your automatics perform best with HARDINGE Master Feed Fingers and Master Collets. The name HARDINGE is your guarantee of accuracy and durability . . . allows you to reap the full benefit of the inherent accuracy of your machines.

HARDINGE Master Collets are ***the only master with no work pressure on the screw*** . . . lasts longer . . . retains accuracy.

HARDINGE Master Feed Fingers and Pads save 30% to 80% over conventional solid feed fingers.

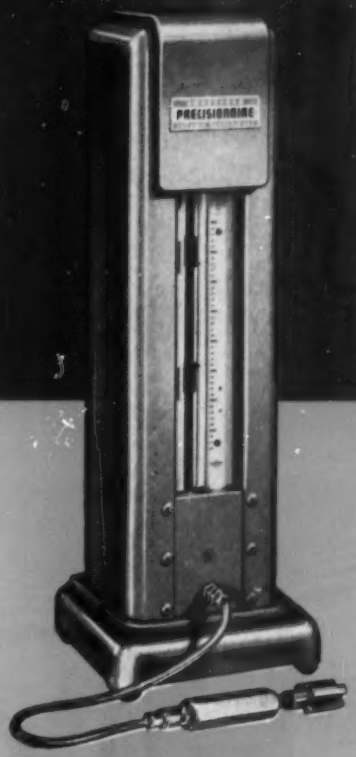
All sizes for all automatics.

Prompt Delivery from these Stock Locations: Baltimore, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, Minneapolis, New York, Oakland, Philadelphia, St. Louis, Toronto, and Montreal.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

FREE DEMONSTRATION



SHEFFIELD Adjustable AIR GAGES

for Short Runs and Emergencies

SUCH AS:

- Aircraft manufacturers, subcontractors and job shops having limited production.
- Accidental damage to a vitally needed single purpose gage.
- An unexpected engineering change involving part size.
- A short run of special parts for which no gages have been provided.
- A mistake or failure in ordering the needed single purpose gages.
- Sudden need for process gages at the production machines.

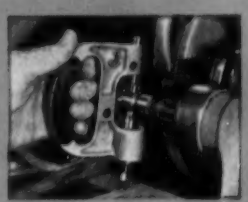
Don't let any of these situations cause costly scrap, delays or embarrassing confusion in inspection, in the shop or in the toolroom. A small investment in the adjustable air gages here illustrated is your best insurance against unpredictable production losses. *The Sheffield Corporation, Div. #1, Dayton 1, Ohio, U.S.A.*

ADJUSTABLE BALLJET SPINDLE KITS
1" to 3"

In 5 minutes you can assemble, for precision gaging, a spindle for ANY SIZE hole from 1" to 3". No auxiliary equipment needed except conventional gage blocks—NOT EVEN ONE MASTER SETTING RING.

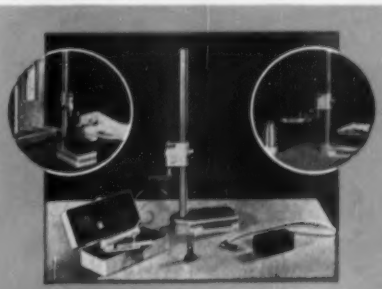
ADJUSTABLE AIREBORE GAGE KITS
3" to 12"

The Airebore Gage can be set precisely to any diameter from 3" to 12" by means of a calibrator and gage blocks. No master rings are needed.



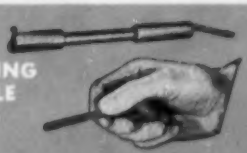
PLUNJET ADJUSTABLE SNAP GAGES
0" to 12"

Twelve Plunjet Adjustable Snap Gages cover a gaging range from 0" to 12"—Larger sizes on special order.



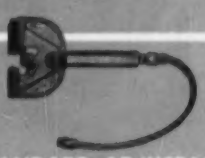
AIRETEST AND PLUNJET STAND

This stand accommodates an Airetest Indicator—also converts to a comparator or height gage by using a Plunjet or dial indicator and anvil.



SELF-CENTERING ADJUSTABLE SPINDLES
.100" to 3"

Four Self-centering Adjustable Spindles cover respectively the ranges of .100" to .156", .156" to .375", .375" to 1.125" and 1.125" to 3". All but the smallest can be set with gage blocks.



STANDARD ADJUSTABLE AIRSNAPS
.125" to 5.125"

Available in 17 models to cover the range .2500" to 5.500". Up to 3.000" the anvil has an adjustment of .250"—above that, .125".

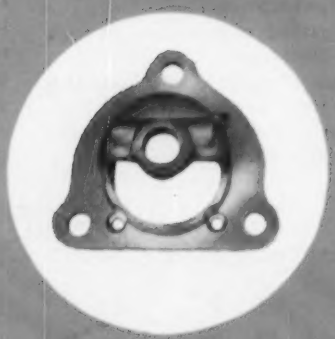
GOLDEN ANNIVERSARY — MASTER CRAFTSMEN HEADQUARTERS

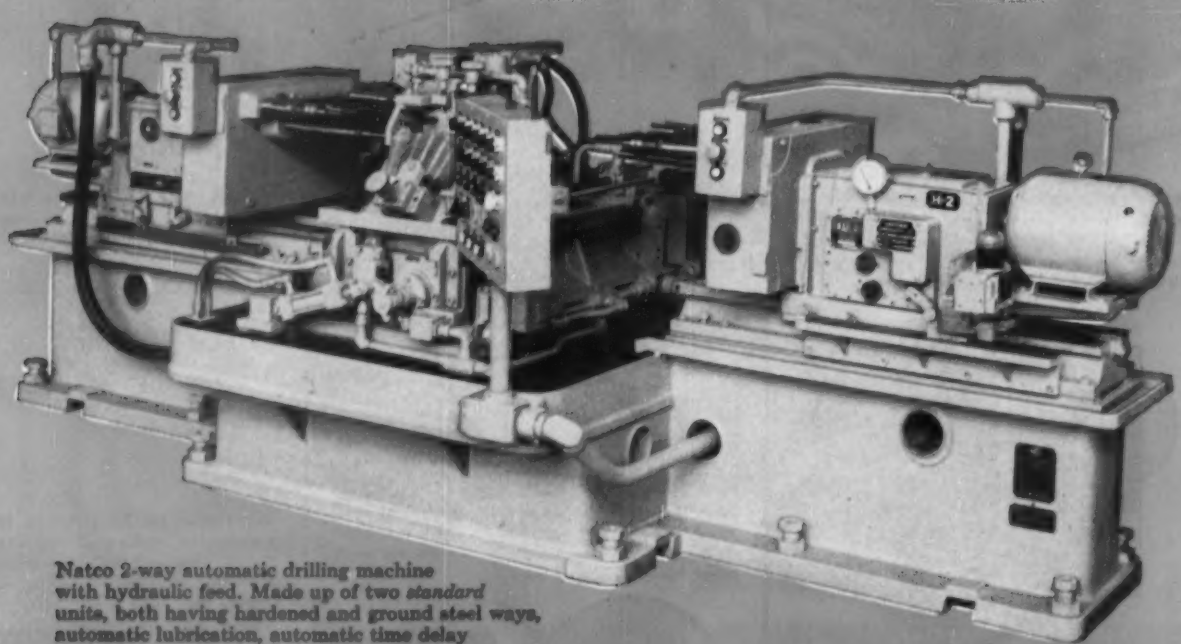
SHEFFIELD

manufacture and measurement for mankind

Call Your Sheffield Representative for a Demonstration in Your Plant

Natco Standard Units Perform Special Jobs

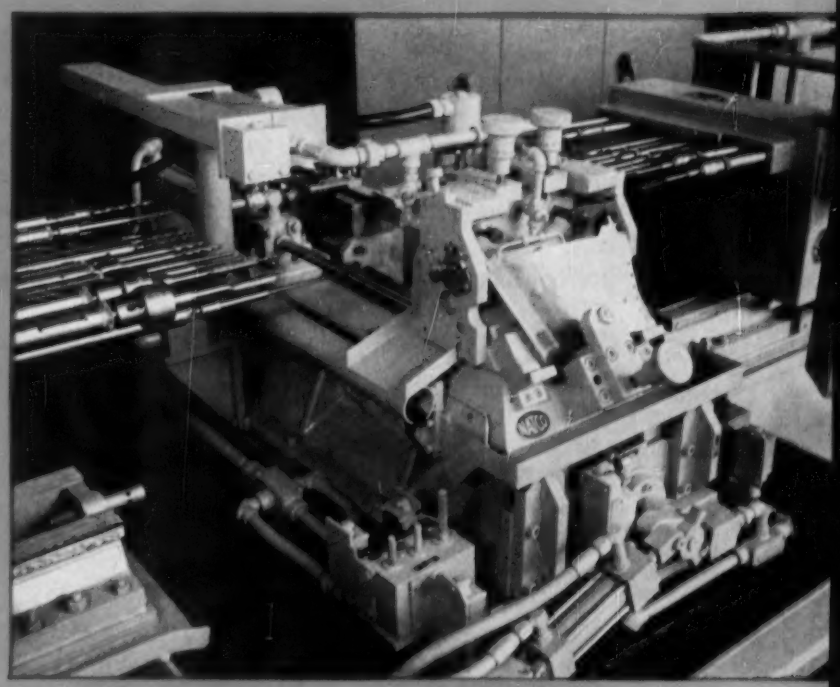




Natco 2-way automatic drilling machine with hydraulic feed. Made up of two *standard* units, both having hardened and ground steel ways, automatic lubrication, automatic time delay and positive stop.

Many *special* jobs can become routine with Natco's *standard* unit design. Take these parts, for instance. Unique parts presenting unique problems. Natco solved them by using *standard* horizontal, self-contained Holeunits with automatic fixtures. Varied operations are performed—production to meet customer's requirements.

Natco's use of *standard* units can mean quicker delivery and lower price to you. Call a Natco Field Engineer to determine whether Natco's *standard* unit design can solve your "special" problems.



Ask for information about the PAYD (Pay-As-You-Depreciate) Finance Plan.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

Richmond, Indiana

NATCO

Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

NEW—from

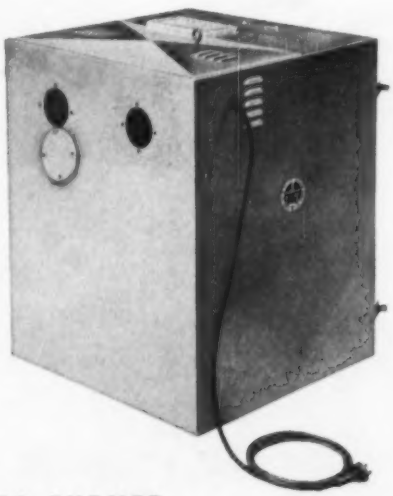
WALKER-TURNER

The finest precision grinders ever built —the new Walker-Turner "Light-Heavyweights". Designed to do the most exacting grinding operations *quickly* and *economically*, and save you time and money. Low initial cost, positive accuracy, and advanced safety features make Walker-Turner Grinders ideal for your plant.

Ask your Walker-Turner distributor to demonstrate the superior advantages of these versatile grinders and other famous Walker-Turner tools. Mail the coupon below for complete information.

NEW WALKER-TURNER
6" CARBIDE TOOL GRINDER

. . . keeps your carbide-tipped cutting tools at peak efficiency. Vibration-free operation assures true grinding. Tables tilt to permit wet or dry grinding at any angle.



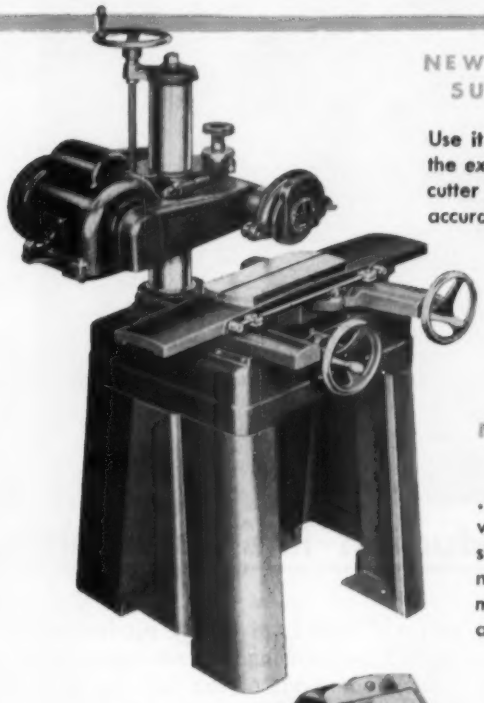
NEW WALKER-TURNER
DUST COLLECTOR

. . . has strong, pressed steel cabinet, removable filter, enclosed ⅓ H.P. motor and fan that moves 350 cubic feet of air per minute. Unit is compact and portable.

A complete line of "Light-Heavyweight"

GRINDERS

to bring you New production economies



NEW WALKER-TURNER
SURFACE GRINDER

Use it as a big capacity grinder that offers you the *extra* ability to do chip-breaker and tool and cutter grinding. You get simple set-up, precision accuracy, *AND* surprisingly low cost.

NEW WALKER-TURNER
7" TOOL GRINDER

. . . combines positive accuracy with advanced safety features. You get dual shatterproof-glass eye shields, engineered wheel guards, dust chutes, removable steel side plates, and adjustable spark deflectors.

NEW WALKER-TURNER
6" BENCH GRINDER

. . . takes up minimum space for grinding, polishing and buffing. Balanced grinding wheels and precision ground shaft provide smooth, accurate performance.

walker-Turner

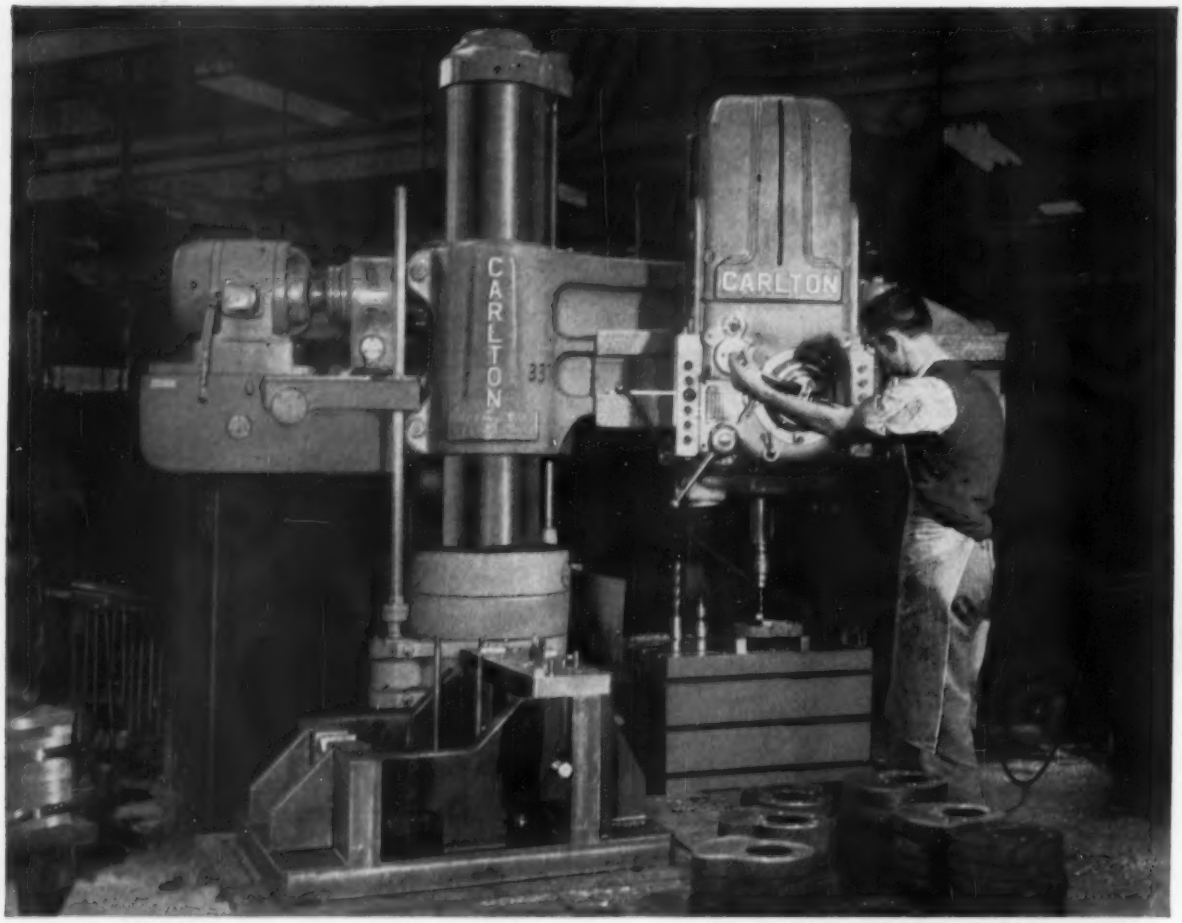
WALKER-TURNER
Division of Rockwell Manufacturing Co.,
Dept. WL-21, 400 North Lexington Ave., Pittsburgh 8, Pa.

( ) Please send name of my Walker-Turner distributor.
( ) Please send literature on Walker-Turner Grinders.

Name_____

Address_____

City_____ Zone____ State_____



Carlton production drilling for production line assembly

Running time reduced from 7 hours on previous method to 5.25 on this Carlton engineered set-up:
(1) Carlton 3-A radial drill
(2) master trunnion
(3) revolving jig
(4) boring bars
(5) transmission body casting
25% savings effected by eliminating horizontal operation.

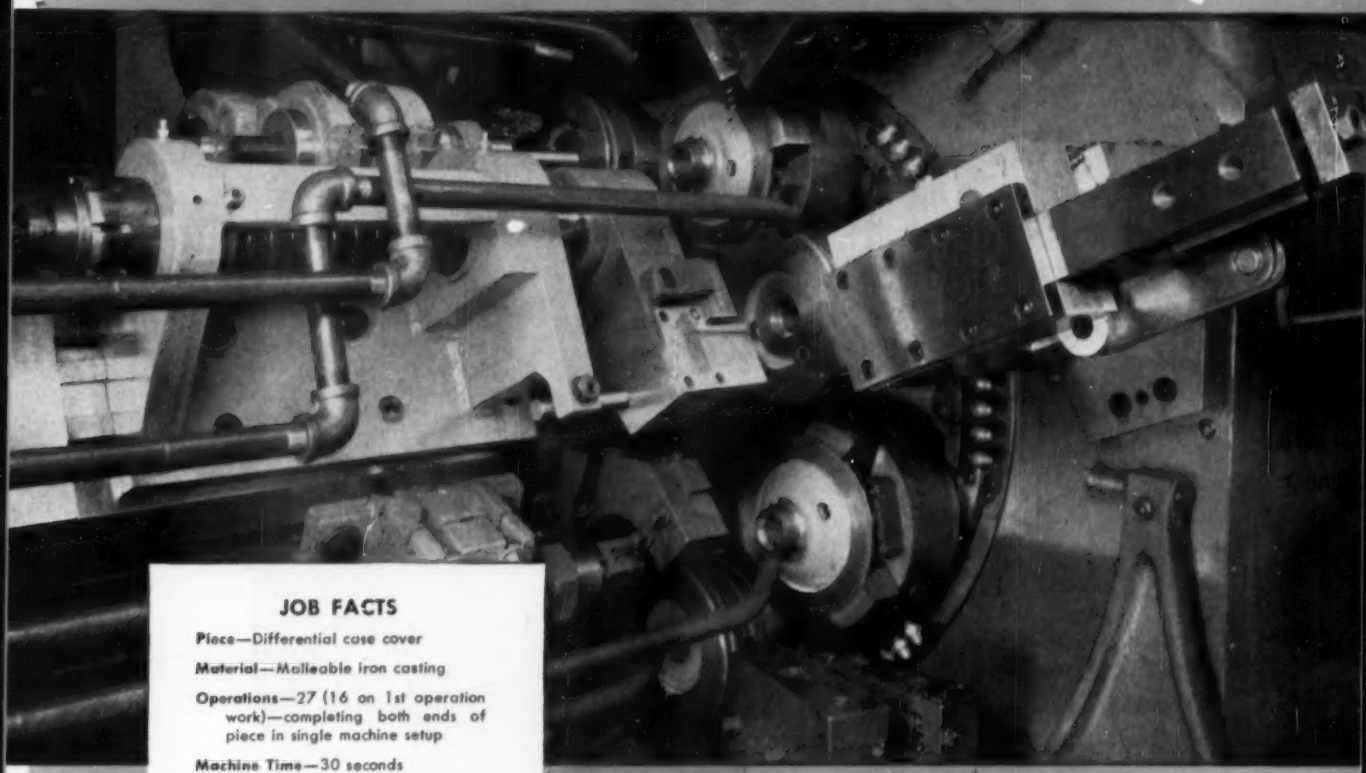
Carlton radial drills, properly tooled, give you production hole drilling with the precision performance so necessary for production line assembly. Parts come out of the drill jig with the uniformity that permits interchangeability of parts, eliminates unnecessary operations, makes substantial savings.

Carlton engineers will be glad to work with your engineers in recommending the best Carlton and the most efficient tooling for your requirements. Carlton radial drills are made in 5 models with arm lengths from 3-ft to 12-ft and column diameters from 9″ to 26″. Carlton horizontal drills made in 4H and 5H sizes. For complete information, call your machine tool distributor, see the Carlton brochure in Sweets Machine Tool Catalog, or write The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

Carlton

HORIZONTAL AND RADIAL DRILLS

Acme-Gridley



JOB FACTS

Piece—Differential case cover

Material—Malleable iron casting

Operations—27 (16 on 1st operation work)—completing both ends of piece in single machine setup

Machine Time—30 seconds

Machine—8"RPA-8 Acme-Gridley Chucker arranged for double indexing

Write today for your free copy of 16-page illustrated bulletin CM-51A that shows and describes how Acme-Gridley 4, 6 and 8 spindle chucking automatics are designed to give you the maximum return on your investment.

minimizes the importance of the decimal point . . . maintains automotive quality control

Continuous quality control, so basic to modern automobile production, was implemented by this manufacturer when he chose Acme-Gridley multiple spindle chucking automatics to perform 27 operations on the piece shown at the left. This not only let him do more operations in a single machine setup but, because of Acme-Gridley inherent design for sustained accuracy at high speeds and feeds, gave him decimal point accuracy that remained within control limits for check lot after check lot. Thus he prevents costly production bottlenecks, reduces scrap and maintains a balanced flow of parts to final assembly points.

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark 2, New Jersey • Chicago 6, Illinois • Detroit 27, Michigan

THREADING COSTS reduced to $0.00003 per piece with new ACME-FETTE Thread Rolling Head. Details on following Page → → →

Acme-FETTE

Cuts threading costs to $0.00003 per piece

On an automotive part that required millions of *duplicate* pieces, one manufacturer found that the application of Acme-Fette thread rolling heads enabled him to:

1. Get required production with 9 Acme-Gridley **bar** automatics instead of 14.

2. Secure better threading **results** with rolled threads which provided smoother, tougher threaded pieces.

3. Show a unit threading cost of *3 one-thousandths of a cent.*

4. Reduce total cost per piece more than 33⅓% while producing in excess of 35,000,000 pieces.

Why not check Acme-Fette advantages on your threading jobs?

New Acme-Fette Type N self-opening thread rolling heads are used with either rotating or non-rotating spindles. They let you complete threaded jobs on your present turning equipment without rehandling — roll threads *5 times faster* than thread cutting methods (and with no chip problem).

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark 2, New Jersey • Chicago 6, Illinois • Detroit 27, Michigan

◄ ◄ ◄ ◄ See — on preceding page — how ACME-GRIDLEY maintains automotive quality control

star performer

...and among high speed steels REX is the leader

Crucible REX® high speed steel has been the winner in shop tests for more than fifty years. *And now REX is even better than ever!* For Crucible research and experience has led to improved manufacturing techniques that mean higher quality – greater uniformity.

Prove the superiority of REX for yourself – on your next job. Check it for size, structure, response to heat treatment, all-around tool performance. Then you'll know why REX has always been the *standard by which other high speed steels are compared.*

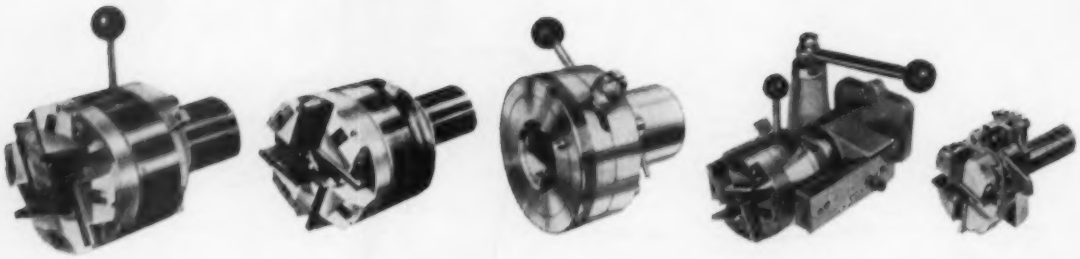
REX is immediately available at all of Crucible's convenient warehouses – or through prompt mill delivery. For a list of available data on REX and other Crucible *special steels*, write for a free copy of the "Crucible Publication Catalog". *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

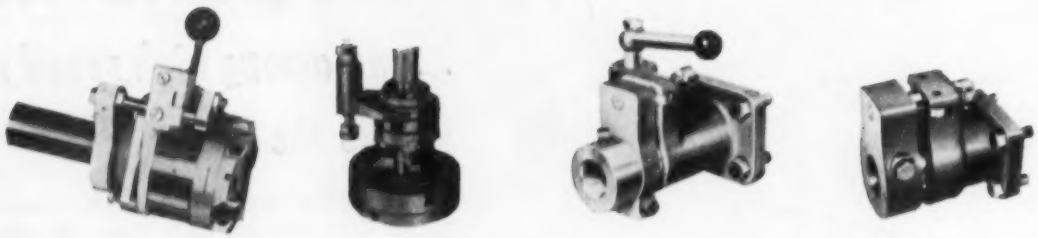
Canadian Distributor — Railway & Power Engineering Corp., Ltd.

◄ ◄ ◄ See — on preceding page — how ACME-GRIDLEY maintains automotive quality

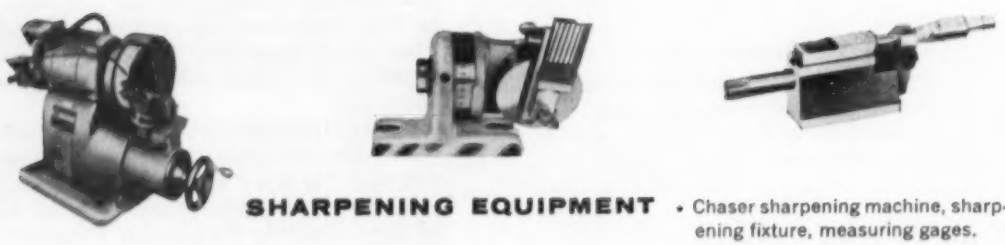


DIE HEADS • Automatic opening tangent stationary and revolving types, tangent taper receding, radial stationary, hollow milling, B&S and small turret lathe types.

Jones & Lamson's thread



ACCESSORIES • External and internal trip attachments, drill press adapters, floating holders.



SHARPENING EQUIPMENT • Chaser sharpening machine, sharpening fixture, measuring gages.

Class III threads guaranteed . . . every time!

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, 502 CLINTON ST., SPRINGFIELD, VT. U. S. A.

Jones & Lamson recently purchased the Modern Tool Works, Rochester, N. Y. This acquisition greatly broadens J&L's service in the thread tool field, by integrating the products and designs of both companies.

Now, J&L, operators of the world's most modern thread tool plant, offers you its own complete lines of die heads and chasers, accessories and sharpening equipment, plus a line of collapsible taps and chasers, solid adjustable taps and chasers, the Modern-Magic Chuck, and the Modern Stud Setter. Complete engineering service is also offered for the entire new combined line of products.

Send today for complete literature.

tool line now includes . . .

J&L MC COLLAPSIBLE TAPS

The same tap may be used on either stationary or rotating jobs. One complete tap, plus parts, gives you five sizes of taps ranging from 1 5/16" to 3½".

J&L MS SOLID ADJUSTABLE TAPS

With ground-thread, precision chasers. Chasers can be removed from tap, reground and reset to cut to original size.

MODERN-MAGIC CHUCKS . . .

AND COLLET EQUIPMENT

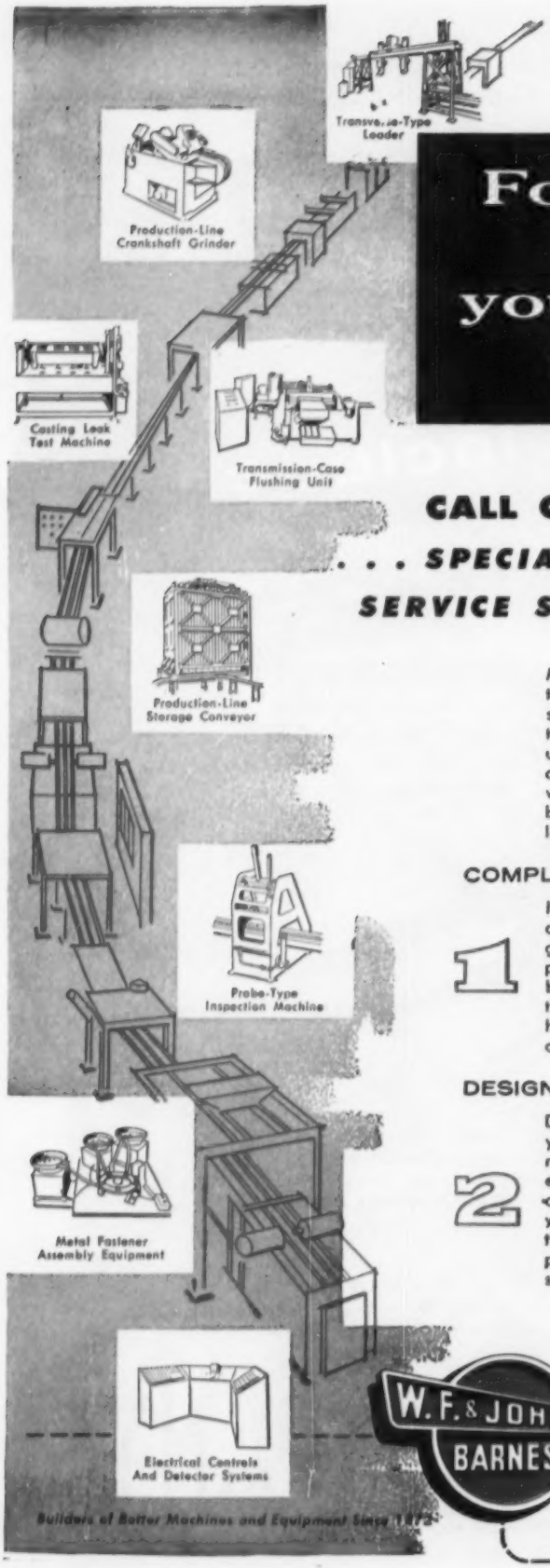
Positive or adjustable friction drive for horizontal or vertical use. MODERN-MAGIC Quick Change Chucks and Collet Equipment virtually eliminate costly idle time of revolving spindles. Using these chucks, tools can be changed without stopping or even slowing the spindle. They give multiple spindle range to single-spindle machines. For instance: you can change collets as fast as you can index a turret.

J&L STUD SETTERS

The new Style M Self-Opening Stud Setter's four-ball drive clutch gives more positive disengagement for more accurate stud heights.

MACHINE COMPANY

THREAD TOOL DIVISION



For a practical solution to your automation problems . . . .

CALL ON W. F. & JOHN BARNES

. . . SPECIAL TWO-FOLD COORDINATED SERVICE SOLVES PROBLEMS QUICKLY

More and more production executives than ever before are today turning to Barnes for help in designing and building specialized automation equipment. With 80 years of practical machine building experience, Barnes have been called upon to design and build hundreds of different types of automatic handling and special processing equipment as well as special high production machine tools. Now, to better serve demands and help you solve automation problems quickly, Barnes offers a two-fold coordinated service:

COMPLETE PRODUCTION-LINE ENGINEERING

1

If you are planning new production-line methods for either automatic or semi-automatic operations, an experienced engineering staff is available to work with you. The detailed plans and proposals submitted for your consideration can be depended upon to provide you with the latest in automation engineering and the very best of proven mechanical, hydraulic, and electrical actuation. Ask for a free survey of your problems early in your planning program.

DESIGNING & BUILDING SPECIALIZED UNITS

2

Designing and building specialized, individual units to suit your specific needs is a separate, additional service. Where required, electrical, mechanical, hydraulic, fixture, and tool engineers work together as a team. All efforts are closely coordinated with complete manufacturing facilities to save you time and eliminate divided responsibility. As illustrated, this service covers hundreds of different types of automatic processing and work-handling units that are today profitably serving a wide range of industrial needs.

ANALYSIS OF METHODS — Call on Barnes engineers today for a practical solution to your automation problems. Or, ask for an analysis without obligation.

W. F. & JOHN BARNES

AUTOMATION SECTION

413 S. WATER ST. • ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS

COME WITH US AND
MEET SOME OF THE
IMPORTANT MEMBERS OF
THE PUTNAM FAMILY

COME WITH US AND
MEET SOME OF THE
IMPORTANT MEMBERS OF
THE PUTNAM FAMILY

OVER 1400 STANDARD TYPES AND SIZES OF PUTNAM HI-SPEED END MILLS

For your convenience and quickest delivery, Putnam catalog lists over 1400 standard types and sizes of highest quality . . . faster cutting . . . longer lasting Hi-Speed end mills. These standard end mills are carried in stock at the factory and by Putnam distributors throughout the country. This means . . . there is a Putnam standard for nearly every milling operation . . . you can select a standard end mill from the catalog today and it can be on your job tomorrow . . . simply call your local Putnam distributor.

PUTNAM RIGID QUALITY CONTROL

Putnam end mills are made by specialists having years of valuable experience . . . machined from high speed steels of rigid analysis . . . produced under a close quality control system that includes individual inspection for a score of important details.

PUTNAM POSTIV-LOK END MILLS

★ *Eliminate Integral Shanks*

★ *Reduce Change-Over Time*

★ *Assure Positive Locking*

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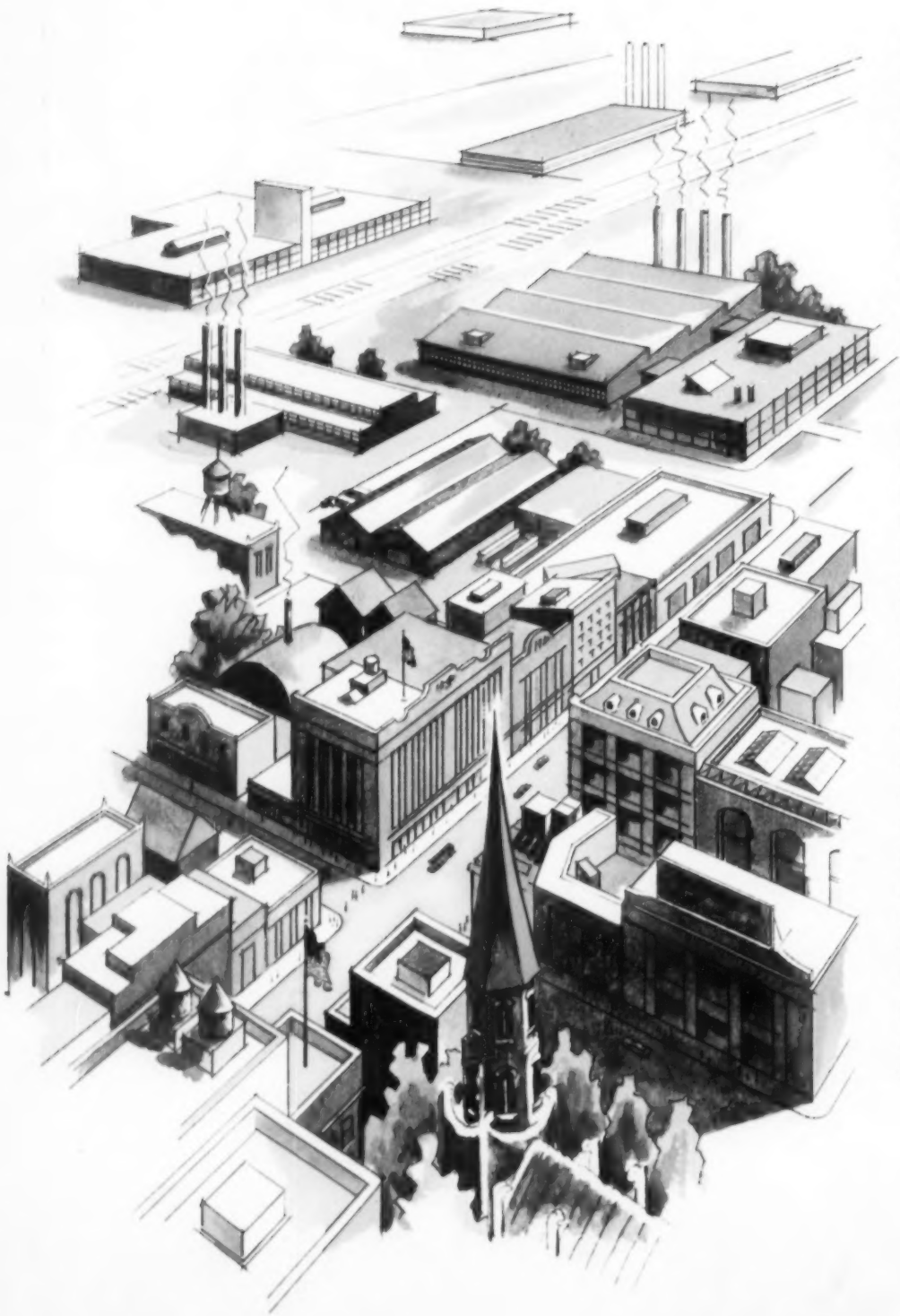
PUTNAM
TOOL COMPANY

2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

YOUR PUTNAM DISTRIBUTOR

Serves Local Industr



We, at Putnam T
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American . . . solid

This is why we, at
a privilege to be
express our thanks

OR . . .

try and the Community

nam Tool Company, are proud of our rganization . . . which has been in the 20 years. Strategically located from st, it consists of carefully chosen business ted members of their community who usiness a career of service.

ors . . . and countless others like them . . . aluable link in the chain of America's tem. Because of them and their business ts we, as a manufacturer of end mills, hout the country: warehouses, display ocal inventories from which our products and quickly delivered to industry.

he nature of their business they must be sity . . . have wide knowledge of many am distributor personnel are familiar ools and their applications in manufac- sses. Into the bargain they must be ookkeepers, market analysts, tax and s, etc.

nd their places of business are an inte- their communities. They are employers . sometimes large, sometimes small. they are substantial business men whose services contribute materially to com- .

ots deep in their respective communities ke an active part in civic affairs. Putnam re found on the rosters of service clubs, nd school activities, and serving with vernments. They are in short: thoroughly solid business men . . . good neighbors.

e, at Putnam Tool Company, consider it o be associated with these men and to thanks for the things they do.

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TOOL COMPANY
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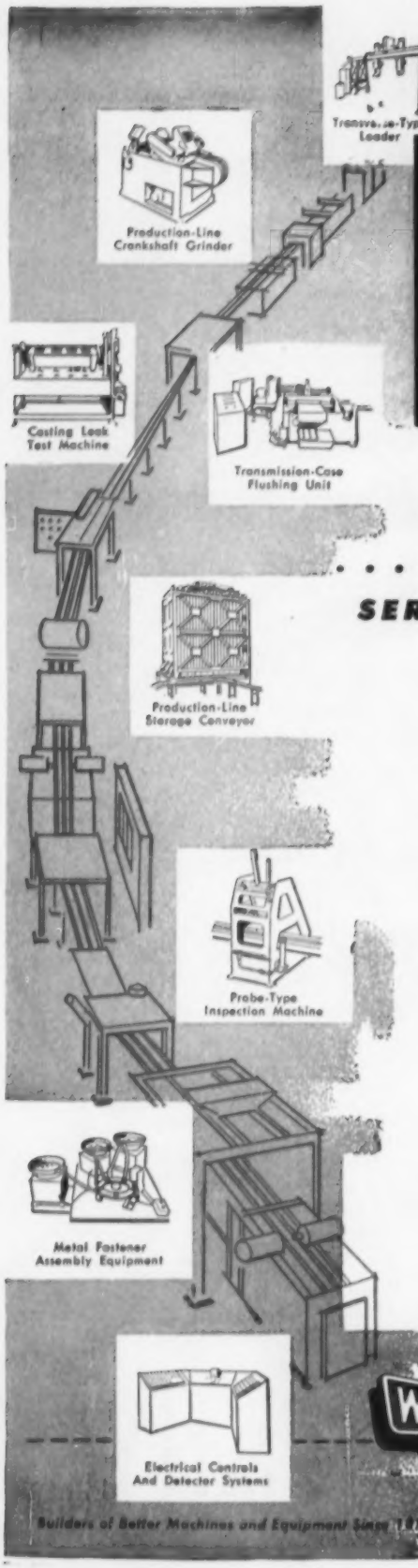

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AUTOMATION SECTION

413 S. WATER ST. • ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS

an ACCO product

Acco Registered* Sling Chains

NEW!
Shaped Section Master Link
Holds its form under loads up to 18% greater.
NEW!
Accoloy X-Weld 125 Chain
Welds as strong or stronger than alloy material. Welded area 2¼ times conventional size area.

New X-weld Chains and New Master Links make ACCO *Registered* Sling Chains better, safer than ever!

• Now, you get even better quality, greater strength and an extra bonus of added safety when you buy ACCO *Registered* Sling Chains. For these famous slings embody two exclusive major improvements.

First, they are made with ACCO's great new Accoloy X-weld 125 Chain, hailed as the greatest triumph in chain manufacture since the advent of electrically welded chain. These chains have *unequalled strength at the welds*, and do not kink, thanks to the full alloy strength lugs and king-size welded areas.

Second, these slings incorporate ACCO's new Shaped Section Master Link which, though weighing no more than the standard round section link, holds its form under loads up to 18% greater.

ACCO *Registered* Sling Chains—the standard by which all other sling chains are judged—are on all counts the finest sling chains you can buy. They will serve you long and well. Buy them the next time you are in the market for slings. Call your ACCO *Registered* Sling Chain Distributor for details—or write to our nearest District Office.

WHAT "ACCO REGISTERED" MEANS

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring on each sling
6. Signed Registry Certificate with each sling

ACCO

*Trade Mark Registered

American Chain Division

AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

plus Rings Links Hooks

Production turning at 1/2 the cost!

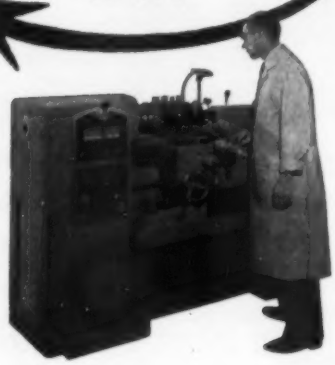
Lodge & Shipley 10″ HI-TURN Production Lathe does job of <u>really big</u> lathe

...and completely outperforms <u>any</u> other 10″ lathe!

BIG in power and production . . . BIG in speed, in rugged construction and accuracy, the Lodge & Shipley 10″ HI-TURN Production Lathe costs only ½ the price of a good 13″ lathe used for comparable work. Here are a few of the many features that put the 10″ HI-TURN in the big lathe, big value class and put it 'way ahead of *any* 10″ lathe:

FEATURE	Lodge & Shipley 10″ HI-TURN	Lathe B	Lathe C
HEADSTOCK			
Full 5 horsepower	yes		
200 to 3000 r.p.m.	yes		
All spur gear drive	yes		
Swing over bed	13¼″		
Spindle speeds	9		
BED			
Width of bed	11⅜″		
Depth of bed	11⅝″		
Hardened, ground, replaceable bedways	yes		
QUICK CHANGE GEAR BOX			
Number of quick change feeds	9		
Range of Feeds, thous. per rev.	1.5 to 24		
CARRIAGE			
Carriage length	19⅛″		
Carriage bridge width	5⅞″		
Cross slide travel	6¼″		
Flame-Hardened and ground cross slide ways	yes		
TAILSTOCK			
Tailstock spindle diameter	2⅛″		
Tailstock spindle travel	4½″		
MISCELLANEOUS			
Size of lathe tool	¾″ x ¾″		
Net weight, base machine	3400 lbs.		
Template type length stops	yes		

<u>You make the comparison</u> *with <u>any</u> 10″ lathe*



Compare the Lodge & Shipley 10″ HI-TURN Production Lathe with *any other* 10″ lathe . . . even with 13″ lathes. If you don't need additional thread chasing facilities, it's the lathe for you!

Get complete details now. Write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Your Lodge-ical Choice for low-cost high-production

Lodge & Shipley

switch

A ~~STITCH~~ IN TIME . . .

If you are trying to patch up holes in your production schedule, then it's high time that you switched to CIMCOOL®, the world's largest selling chemical cutting fluid. Here's how CIMCOOL can save you money and increase your production.

- **CIMCOOL INCREASES TOOL LIFE** (and thus reduces down-time) because of its chemical lubricity.
- **FASTER SPEEDS** and feeds are possible because CIMCOOL cools faster, for it combines friction reduction and cooling capacity in a degree never before attained.
- **CIMCOOL COSTS LESS** than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. Because of its low surface tension and low adhesion to work and chips, there is practically no carry off. And CIMCOOL *is clean*—leaves no slippery film on hands, work or floor.

But these are only a few of the CIMCOOL Standard Concentrate advantages that will help you sew up savings in your plant. For complete details, consult your CIMCOOL distributor. He'll be happy to tell you all about CIMCOOL—as well as the entire family of CIMCOOL Cutting Fluids. Or contact us direct and we'll send one of our Cincinnati Milling-trained machinists to call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive**—For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

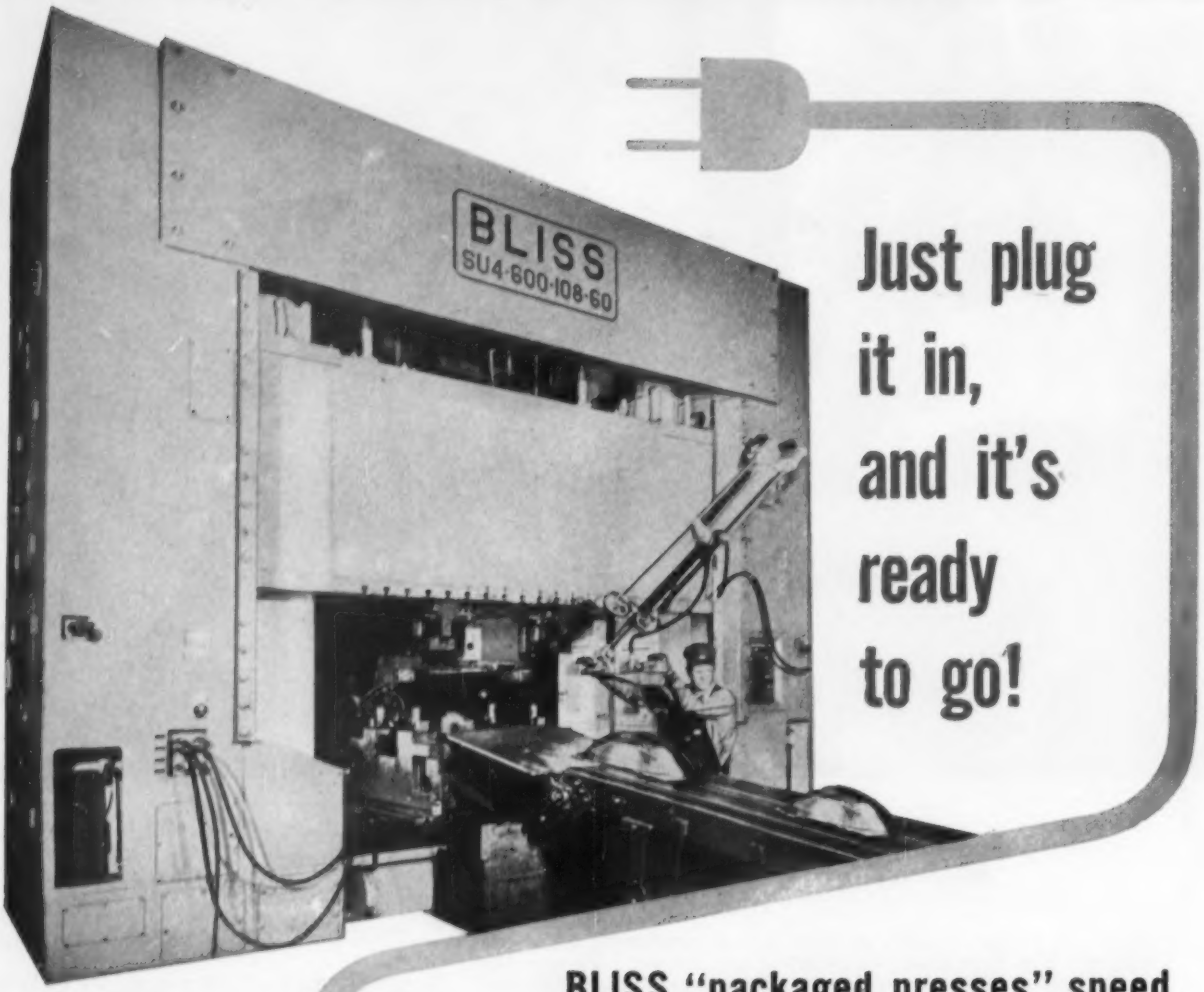
CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

*Trade Mark Reg. U.S. Pat. Off.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.



Just plug it in, and it's ready to go!

BLISS "packaged presses" speed installation and simplify maintenance

Automation created the problem—The dopers, kickers, lifters and other materials handling devices so popular these days brought a maze of wires and pipes in their wake. And aside from looking untidy, they slowed maintenance and proved, annoying to crane operators.

"Packaging" solved it—Now, in Bliss' new line of presses, all the pipes and wires, and controls are built into the uprights. Each air and electrical line is tagged—simple to find, simple to fix. Controls are centrally located. The exterior is clean and uncluttered—cranes can move up close to change dies.

Bliss designers have come up with completely new two point and four point presses—both single action and multiple action. Design features include extremely rigid frames, eccentric drives, high speed clutches, extra long connections, motorized adjustments and many others. The entire line of presses is described in a comprehensive 32-page catalog, No. 11-B, just published. Copies for you and your staff are available by writing to E. W. Bliss Company

NEW AUTOMATION CONTROL

This new nine-station rotary limit switch will control stops, starts, interlocks, motion, time, or recycles of auxiliary equipment. Each station can be set from 0° to 360°, can be operated either normally-open or normally-closed, and is accurate within less than 1°. Write for Bulletin 33.

BLISS
SINCE 1857

is more than a name...it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

Presses, Rolling Mills, Rolls, Special Machinery

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, Calif.; Branch Offices in Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. Other representatives throughout the world.

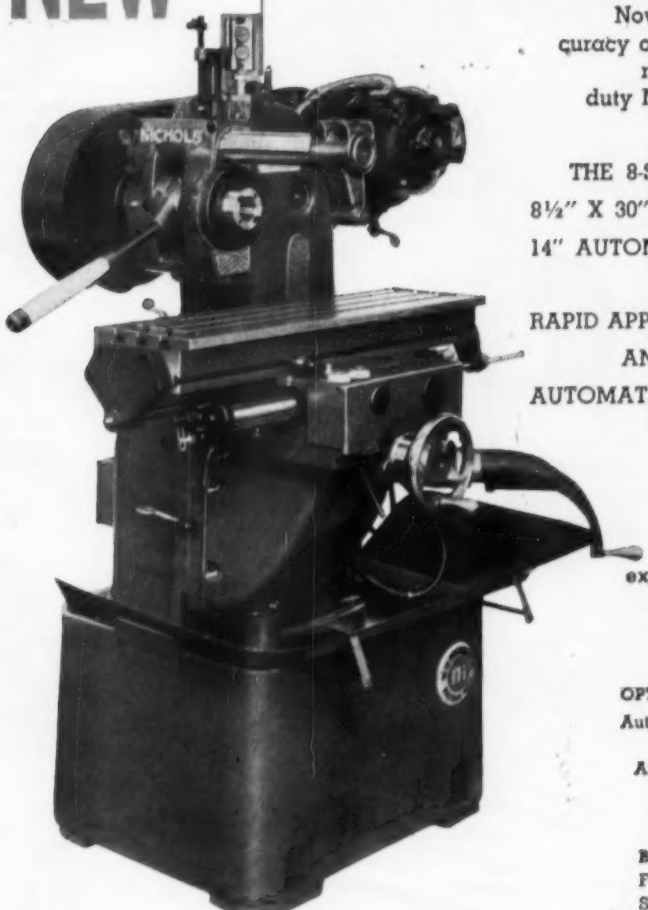
"Anything almost right is wrong"

W. H. NICHOLS
1873 1951

NEW NICHOLS

Semi-Automatic Miller

Now Nichols matches the unequalled accuracy of its famous hand-miller in the new semi-automatic heavy duty Miller #8-SA.



THE 8-SA MILLER BY NICHOLS PROVIDES
8½" X 30" TABLE WITH 3 T-SLOTS
14" AUTOMATIC PNEUMATIC LONGITUDINAL TABLE FEED WITH
RAPID APPROACH, SLOW CUTTING FEED,
AND RAPID RETURN . . .
AUTOMATIC TABLE WAY LUBRICATION.

The Nichols 8-SA is a production miller with vertical and transverse table screw feed featuring a **heavier knee** and **extra wide saddle** for greater bearing surface . . . air equipment **inside** the saddle saves space.

OPTIONAL:
Automatic Pneumatic Down Feed To Spindle Head
Automatic Pneumatic Transverse Table Feed
Automatic Milling Cycle through synchronization of any two pneumatic feeds.

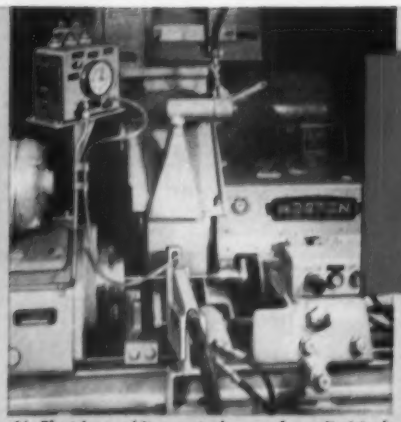
BRIEF SPECIFICATIONS: • Table 8½" x 30" Feed 0-60" min. • Rapid traverse 300" min. Spindle speeds available up to 5000 rpm.
Range: Longitudinal table feed 14"
Transverse table travel 6"
Vertical travel of knee 11"
Rise and fall of spindle head 4½"

Write for catalog on the Nichols way to increase production and lower costs. Reservation may be made for sound, color film, "The Miller That Uses Its Head".

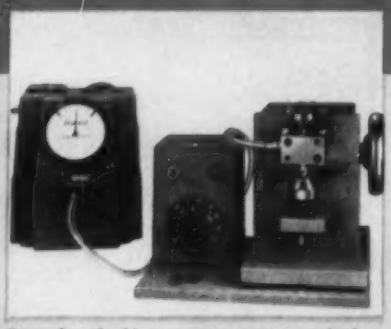
W. H. NICHOLS COMPANY
WALTHAM 54, MASS.

National Distributors
THE ROBERT E. MORRIS COMPANY, P.O. Box 341, 1 Farmington Ave., West Hartford 7, Conn.

How would you



Air-Electric machine control gage for cylindrical grinder.



Gage for checking gyroscope rotor end play.

Series 205 Hole Location Gage checks holes in workpiece for parallelism.

Gage for checking taper on piston skirts.

Model 1000P-61 Adjustable Snap Gage

Series 1250 Hole Gage

Model 88P-10 Inside-Outside Diameter Gage

Recording individual measurements taken with an air-ring.

Model 75P-10 Adjustable Depth Gage

Series 43 Thread Pitch Diameter Gage

Federal's Solution to the Cost of Gaging:
Impartial Gage Selection
Engineering Follow-Through
Everything in Gages

No. 247 radial play gage for ball bearings.

Model 130 Electronic Comparator

Model 136 Horizontal Master Comparator

GAGE THIS DIMENSION 10 times or 10,000 times?

It is claimed that 75% of all metalworking production is made up of small lots of 25 workpieces or less. This emphasizes that in most cases it is important to carefully select gages at the lowest cost commensurate with necessary accuracy.

Federal makes a complete line of all types of gages employing practically every system of visual gaging. Listed in our catalog and readily available from stock are countless Dial Indicator Gages ideally suited for everyday inspection of small runs. When a higher degree of accuracy, foolproof operation, and faster gaging are required, the purchase of a Federal Dimensionair Air Gage may pay big dividends. And where large production warrants the investment, we design and build automatic gages for high speed sorting and machine control.

When a manufacturer makes only certain types of gages, he naturally recommends these for all applications. For instance, a manufacturer who specializes only in Dial Indicating Gages obviously cannot meet every modern gaging requirement. Neither can an Air Gage manufacturer honestly recommend his type of gage for every measuring job. Those who buy the wrong gage can't be blamed if they don't know the facts.

Before you decide what gages you need, bring your problems to Federal. Our engineers, without bias, will suggest the *best* solution . . . and may save you considerable money. Write or call us today.

FEDERAL PRODUCTS CORPORATION
61211 Eddy Street • Providence 1, R. I.

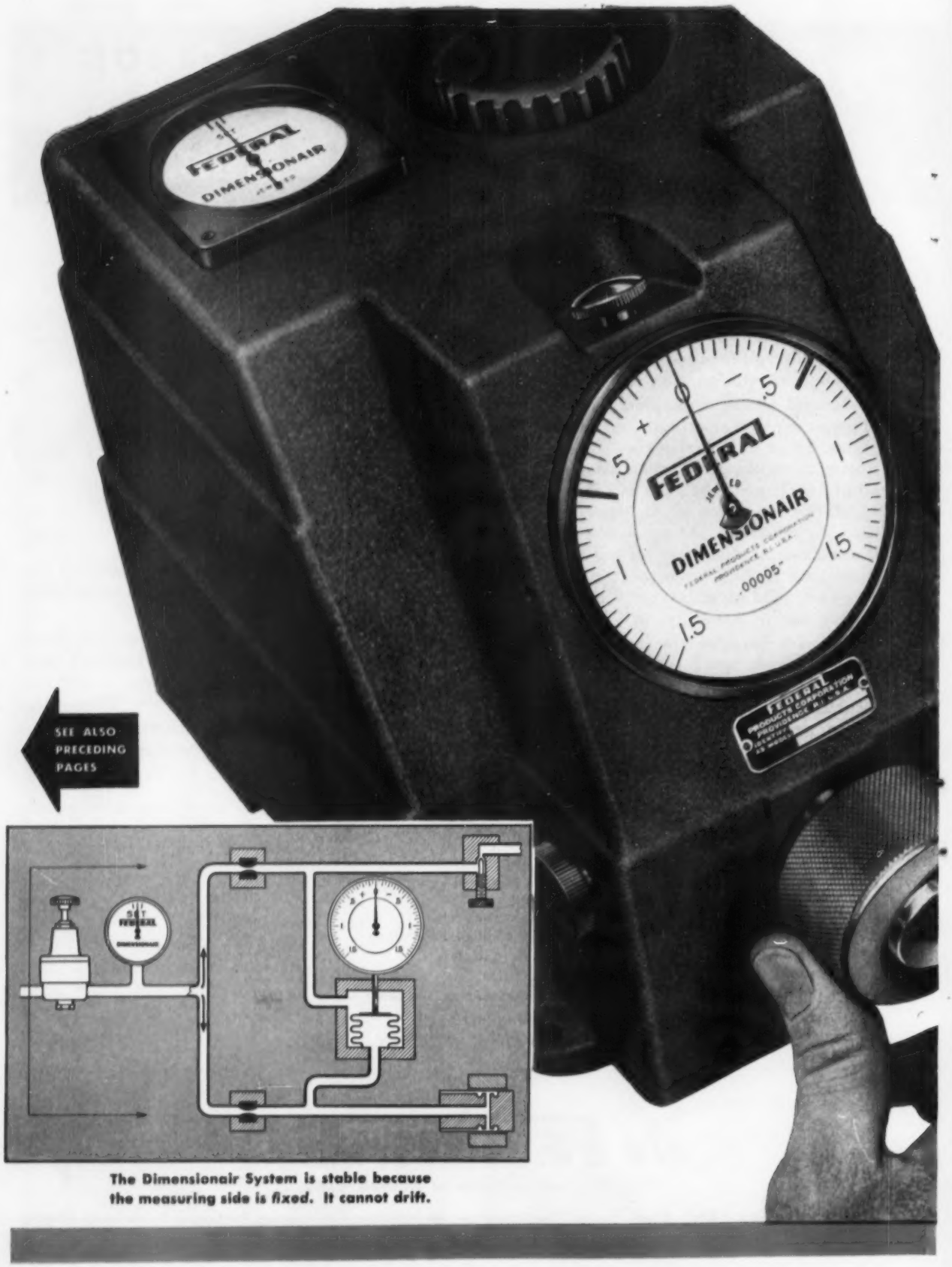
- Air-Electric Gages
- Air Gages
  - a full line of accessories
- Automation Gages
  - Employing all gaging systems
- Grinding Gages
  - Continuous
- Dial Indicator Gages
  - Catalog and Special Types
  - Thousands of Designs
- Dial Indicators
  - The only complete line
  - Regular type — hundreds of Variations
  - Super-sensitive
  - Perpendicular indicators
  - Test indicators
  - Lifetime
  - Dial Indicator Test Sets
  - Wetproof Indicators
  - Long range indicators
- Electric-Dial Indicator Gages
- Electronic Gages
- Micrometers
  - Indicating
- Master Setting Disc & Rings
- Multiple Dimension Gages
- In-process Gages
- Thousands of special designs for thousands of special needs

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

SEE ALSO NEXT PAGES

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging



SEE ALSO PRECEDING PAGES

The Dimensionair System is stable because the measuring side is *fixed*. It cannot drift.

WHY more and more people decide to buy the—

DIMENSIONAIR

As more people have the opportunity to experience the basic advantages of the Dimensionair their enthusiasm for its dependable accuracy has greatly influenced the swing to this air gage which does not drift. Its graduated scale is positively linear and can be depended upon to remain stable under normal gaging practice.

The stability of the Dimensionair is due to its differential air system which cancels out minor pressure variations and surges. The *measuring side has no zero adjustment* in it. It is positively *fixed* and *cannot change*. The gage magnification remains stable for hours — days . . . indefinitely. It does not drift.

The other side of the system . . . the balancing side . . . has the zero setting adjustment which can in no way affect the stability of the measuring side. This side can also be adjusted to compensate for the effects of temperature changes in the gaging plug or unit. Temperature variations do not affect the accuracy of the Dimensionair system itself.

Another great advantage of this system is the simplicity and positive directness with which the gage is set to zero. Since the measuring system is rigidly fixed, the gage is instantly set to zero without trial and error adjustments.

Let your inexperienced operators try it. You can't appreciate how dependable and foolproof it is until you and others in your department or plant actually try it.

Ask our nearest Branch Office to let you try a Dimensionair.

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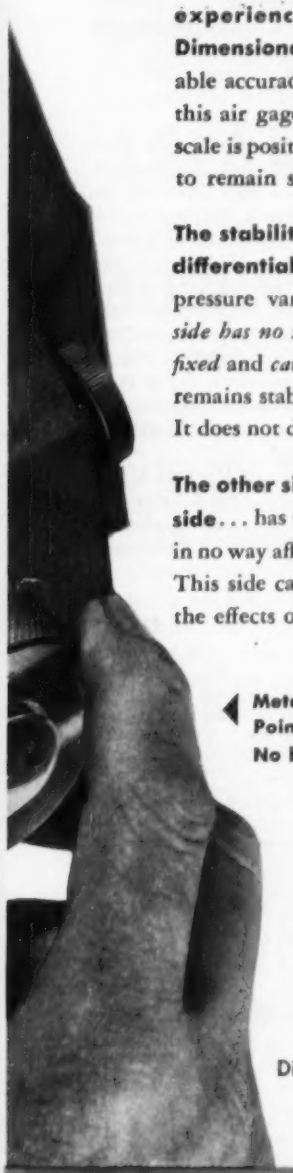

Meter is extremely simple, and wearfree. Pointer movement is fast and positive. No bobbing.

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If you're thinking about saving time and money look at what you can do with a Minute Man Keyway Broach Kit. In just one minute, for as little as one cent, you can cut a keyway from 1/16" to 1" in any bore from ¼" to 3".

Minute Man® Broaches for square and hexagonal holes and Production Type Keyway Broaches are also available from stock at your Industrial Distributors'.

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Company.....

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Letters...

To American Machinist
330 W 42nd St, N Y 36, N Y

Happy to Oblige

Our company would like permission to reprint your editorial "Keep the Contest One-Sided" (*AM*—Aug 27 '56, p87). We would like to include this reprint in a mailing to our employees. We feel that it is important that this type of information be brought to as many people as possible.

Clarence J Treon
The Sheffield Corp
Dayton, Ohio

Congratulations, Sir Alfred

In reading your machine tool news report (*AM*—Sept 24 '56, p107) with its mention of Sir Alfred Herbert and his undertaking representation of Lodge & Davis as a result of an inquiry appearing in *AM* at that time, I was mindful of the late Wallace Carroll having told me of the beginning of an association with the company, and with Sir Alfred as an individual from that time prior to 1892 up until the early 1930's. Mr Carroll mentioned the manner in which this association came about, and that Sir Alfred was responsible in no small measure for promoting American machine tool sales in Great Britain, as well as in certain parts of the European continent.

I understand that, despite his 90 years, he frequently goes into the works at Coventry and reviews some of his thoughts with the staff.

I wrote him a day or two after seeing your editorial, congratulating him on his 90th birthday, on behalf of Lodge & Shipley, and a personal note on behalf of myself, and referred to the prominent part he had played in assisting the recognition ultimately established by our infant American Machine Tool Industry. In return, I received a personal reply from Sir Alfred, which I had not expected, together with a signed picture of himself.

J Herbert Myers
vp & sales mgr
Lodge & Shipley Co
Cincinnati

SHOPMATES

N. Jarvis

I'VE BEEN WATCHIN' HIM SQUIRT OIL AT THAT DRILL FER 30 YEARS AN' I AIN'T SEEN HIM HIT IT ONCE.
HE'S GOT THAT BIG BOX OF SAND FER A CUSPIDOR AND HE AIN'T NEVER HIT THAT EITHER!
N. JARVIS

SHOW THIS TO YOUR TOOLMAKER

Ask him if he doesn't agree that the Leland-Gifford No. 2LMS Toolroom Drill Press provides every feature and convenience needed in the modern toolroom for fast, accurate, effortless drilling and tapping. Developed in cooperation with leading tool engineers, this machine has won wide acceptance as the ideal drill press for general purpose toolroom use. Write for complete information.

LELAND-GIFFORD
No. 2LMS
TOOLROOM DRILL PRESS
with all these features:

1. Illuminated indicating shift with cutting speed chart.
2. Conveniently located hand wheel for changing spindle speeds and shifting back gears without stopping machine.
3. Positive stop for accurate depth adjustment.
4. Capacity of No. 2 Morse taper. No. 3 MT optional.
5. Extra large 37″ x 25″ or standard 26″ x 25″ work table.
6. 26″ swing with 13″ overhang.
7. Handy push-back table raising crank and quick-acting table lock.
8. Foot switch start-stop motor control leaves operator's hand free.
9. Counterbalanced sliding head for effortless vertical adjustment.
10. Built-in light for table and work surface illumination.
11. Reversing motor control for tapping — provides manual control from feed lever or automatic control by depth stop.
12. Sensitive hand lever feed with ratchet adjustment.

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WALKER...

and a great industry

For more than fifty years automotive production has relied on Walker holding devices. One of the most popular chucks in the Detroit area is Walker 617 CG (concentric gap) type, a rectangular chuck that combines longitudinal and transverse gaps. Produced in sizes to meet all holding requirements.

Walker engineers can solve any holding problem.

What is yours?

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

PIONEERING IN MAGNETISM

The longest and broadest experience is yours when you specify a Walker Chuck, for it was nearly seventy years ago that O. S. Walker produced the first successful Magnetic Chuck. Since then, the know-how in magnetic holding devices has been evident in countless applications of rectangular, swiveling, rotary and special type chucks. And, within the last decade, the O. S. Walker Company engineers have perfected Special Vacuum Chucks to harness atmospheric force to all non-magnetic materials. The Walker line also includes, Demagnetizers, Planer Parallels, and all types of Special Magnetic Lifts.

Walker engineers, ready to help you with your holding and lifting problems, are always as near as your telephone, Worcester, Massachusetts—PL 6-6293.

Oops!

After nearly ten years of reading *AM*, I have found a monumental boo-boo. Your special report on "How to Cut Off Metals" (*AM*—Aug 13 '56, p140) mentions circular cutting wheels on p140, second column, third paragraph.

But on page 145 you carry an illustration from, I would guess, Continental of Chicago, showing typical cutting-wheel edges. The caption is confusing; the first sentence refers to abrasive cutoff wheels, and the second doesn't mean anything because abrasive cutoff wheels are not designed with beveled edges. In addition, circular cutting wheels are used on lathe-type machines, not ". . . column machine (s) with back-and-forth motion. . . ."

Buckley Sullivan
Cleveland, O

Reader Sullivan is dead right. This wasn't just a typo—it was a real goof. The illustration does show various steel cutoff-wheel shapes; the caption was originally intended to refer to a sketch of abrasive wheels, and the two got together, and mixed up, by mistake. We apologize—Ed.

Throw Out the Lifeline

I have been rereading your editorial entitled "A Must—More Skilled Men" (*AM*—Dec 19 '55, p103).

Your article is the typical one that comes from industry. Does industry ever think of the thousands of high schools that are turning out "could-be good me-

chanics?" No, you don't. The place to begin is in the high schools and junior colleges, not in industry.

I am a teacher in high school. I teach machine work to boys who need a lot of help from industry and community leaders like yourself. Get the boys interested in industry at an earlier age. Do we have awards and scholarships for the promising high-school machinist or other trades boys? No! Why not? Industry does not care. Industry takes practically no interest in us. Look at your own magazine. Do you ever talk up the schools? What does your magazine, or any oher magazine contribute in the way of getting more skilled help from the beginning level? What interest can I, as a teacher, show these boys about industry being interested in them? I mean a real helping hand, not just some motion pictures that are sent from school to school.

This last year, the George Bardon Act was used to its fullest extent of $29 million for the schools, plus the usual $7 million from the Smith Hughes Act. What is this money? A drop in the bucket! How can this help thousands of high schools? Have I ever seen support in your editorials for school bills; suggestions to industrialists to help the schools' technical programs; to interest boys in industry?

Give our boys the incentive through industrial help or some inclusive help in your magazines. We have good potential skill that is dragging because of lack of interest. Thousands upon thousands of boys drop out of school from lack of interest before high-school graduation. Other thousands take a jumble of subjects in high school. We shop people should be the elite in the school, but we are sent the boys who cannot get along in the so-called academic classes. During the war, we did all right. Why can we not keep up this prestige? Our shop boys did a wonderful job when the incentive was there to help them.

What can you do to help us? You can start the ball rolling by the power of the press. Our potential is asleep. Let us start with your American Machinist. I am teaching boys for the machinist trade who need more help.

Bev W Morant
Sierra Madre, Calif

Your plea has not fallen on deaf ears. See the editorial (AM—Sept 24 '56, p115)—Ed.

W&B
CARBIDE DRILLS and REAMERS
★ LONGER LIFE
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★ MAXIMUM PRODUCTION
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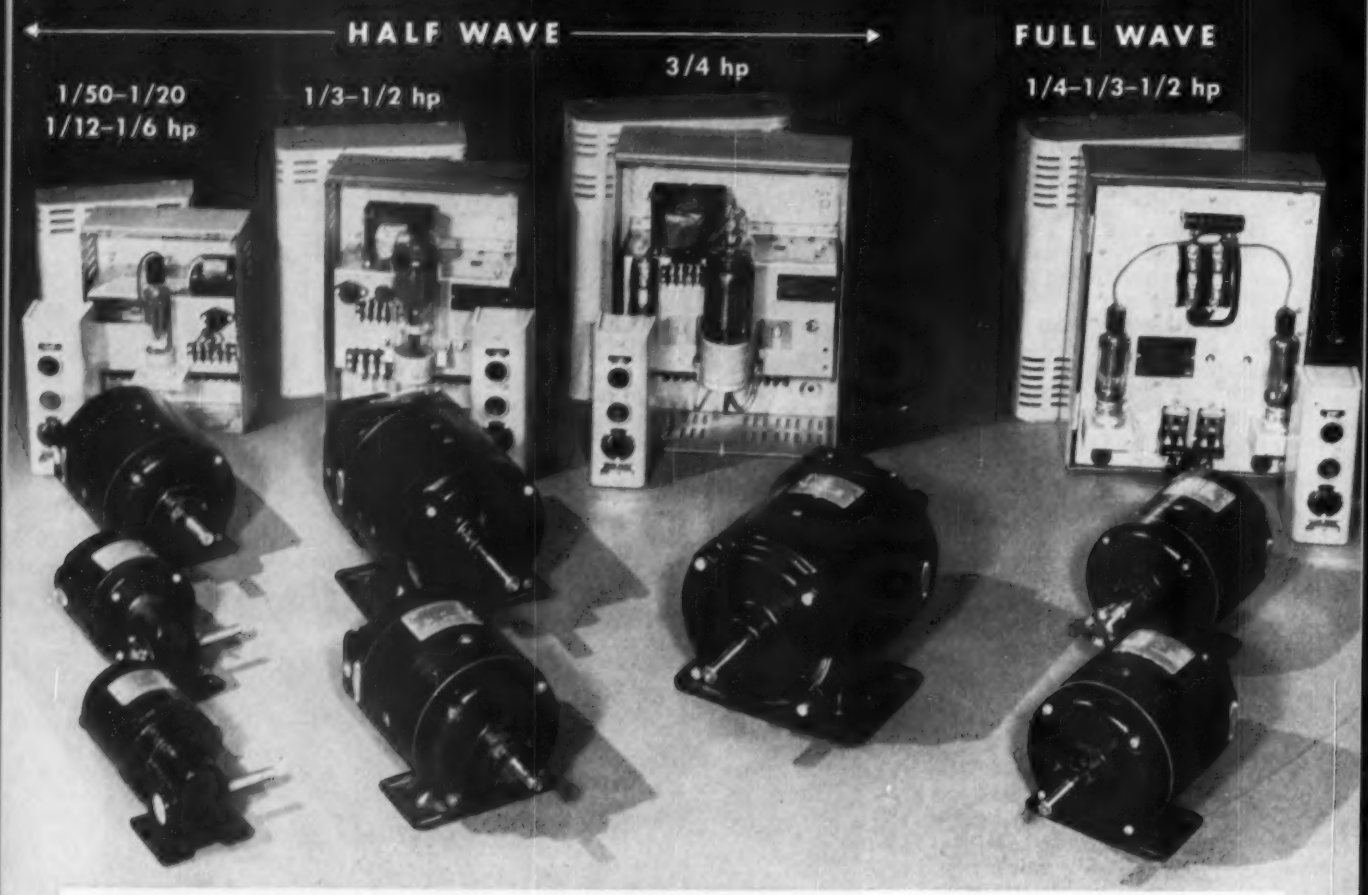


A DRIVE TAILORED TO EVERY JOB is the achievement of General Electric engineers who designed the new fhp Thymotrol drive line. Here are examples of this versatility:

Three panel sizes now cover the fhp range, making smaller ratings more compact, more economical than ever before.

Full range of ratings

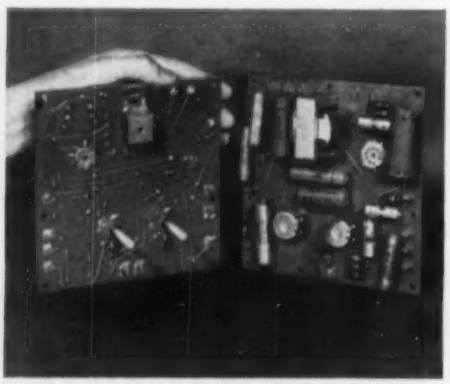
- Horsepower: 1/50 to ¾†
- Power supply: 220 v a-c, 50/60 cycles
- Speed range: 20 to 1
- Speed reg.
  (NL to FL): half-wave — 3%, full-wave—5% (adjustable to flat at any specific speed)

†Plus a full line of integral-hp drives.

Building-block design—you get the exact performance you want by selecting any combination of these optional features:

- Reversing operation
- Jogging (pre-set or run)
- Dynamic braking
- Tachometer follower
- Overload relay protection
- Tube warm-up protection

ONE-TUBE DESIGN of G-E half-wave Thymotrol drives minimizes tube maintenance. This type drive is suitable for most adjustable-speed jobs.



PRINTED CIRCUITRY, DIP SOLDERING are effective techniques which permit new lower General Electric prices. Exhaustive tests prove the sturdiness of this construction for industrial use.

PLUG-IN PANEL BOARD can be quickly removed for maintenance or replacement to minimize downtime—a must on such jobs as production conveyors.

NEW full line of fractional-horsepower G-E Thymotrol* adjustable-speed drives—more compact, more rugged, more reliable, easier and more economical to maintain, yet priced up to 18% below previous models

General Electric announces a completely re-designed line of fractional-hp Thymotrol adjustable-speed drives—*designed to save you up to 18% over prices of previous models.* These versatile new drives are applicable to conveyors, machine tools, in fact, to almost every small machine whose performance can be improved by adjustable speed.

SELECT JUST THE DRIVE YOU NEED —AND SAVE MONEY!

Biggest cost-saving for you with new G-E Thymotrol drives is that you buy only as much drive as you need. For some applications, you'll want only the basic half-wave drive: motor, simple one-tube control, and control station. For more complex jobs, you can select any combination of seven different optional accessories to provide desired performance. To further match drive to job, these popular half-wave drives come in three panel sizes.

For rapid acceleration of high-inertia loads, for extra-smooth performance, or for flat speed-regulation adjustment, you'll want the new full-wave Thymotrol drive, with still other optional features.

NEW DESIGN IS SIMPLE, RELIABLE

In designing new G-E Thymotrol drives for mass production, G-E engineers have also included many new features for longer life, lower operating costs, increased reliability:

Plug-in panel boards on half-wave units can be quickly removed without disturbing customer wiring for fast inspection, repair, or replacement, minimizing downtime.

Printed circuitry and dip soldering result in more compact units which simplify your design problems. Shock and vibration tests show this construction really stands up in industrial use. Parts replacement is simple using soldering iron and pliers.

20:1 speed range is now standard on all ratings. And operator can turn machine to full "off" with speed-control knob.

High tube reliability—all tubes on G-E Thymotrol drives are fully guaranteed for one year, usually last far longer.

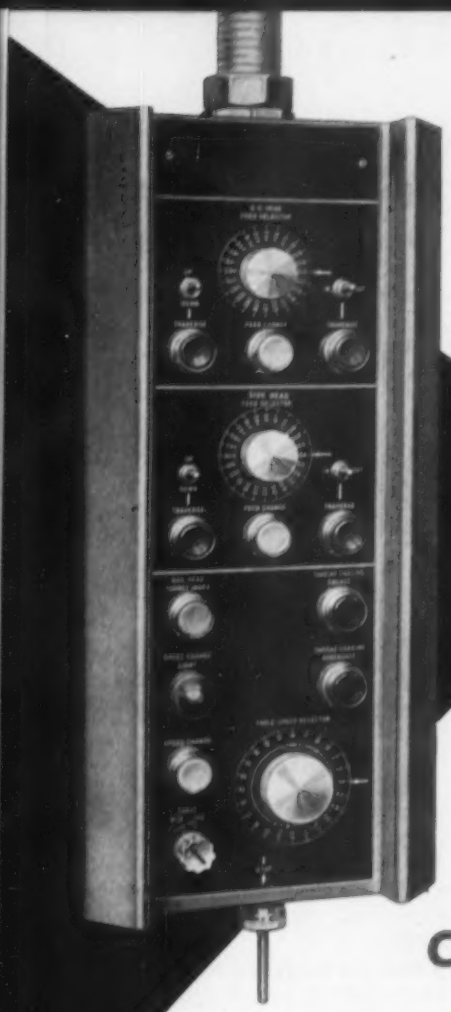
SIMPLE PACKAGED DRIVES OR ENGINEERED MULTI-MOTOR SYSTEMS

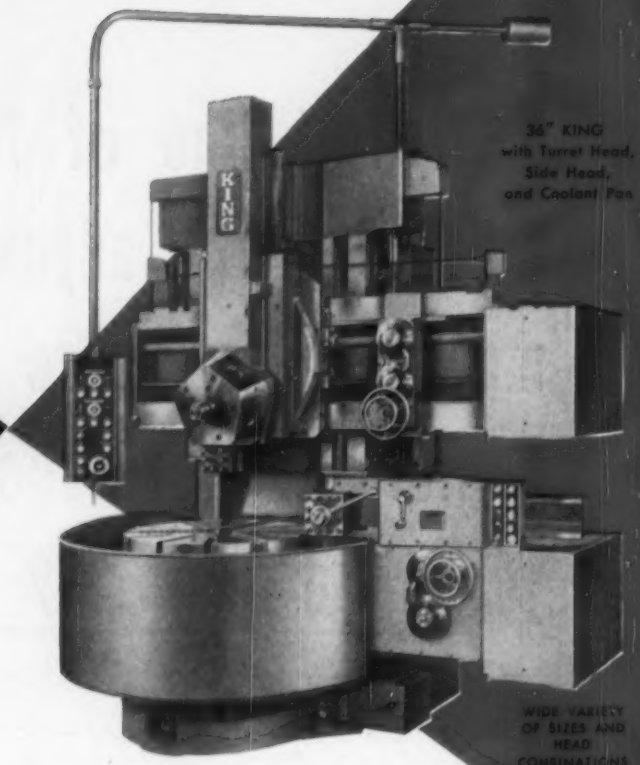
Whatever your adjustable-speed needs, from packaged single-motor drives to specially engineered multi-motor systems, you'll find the answer —*at new low prices*—at General Electric. See your G-E Apparatus Sales representative today. Or write for Bulletin GEA-6519 to Sect. 791-3, General Electric Co., Schenectady 5, N. Y.

*Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC





36" KING with Turret Head, Side Head, and Coolant Pan

WIDE VARIETY OF SIZES AND HEAD COMBINATIONS

Complete Electrical Controls on the all new KING speed set-up and production time

ALL CONTROLS CONVENIENT TO OPERATOR

LOCATED ON PENDANT—

Feed and rapid traverse movements
— and —
Pre-selective feed selection
from direct-reading dials:

for rail heads on machines with two heads on rail . . . for rail head and side head on machines with one head on rail.

Power swiveling of rail heads

Pre-selective speed selection from direct-reading dial

Speed change • Turret index • Table stop

LOCATED ON SIDE HEAD PANEL—

Feed and rapid traverse movements of side head
— and —
Pre-selective side head feed selection
from direct-reading dial:
on machines with two heads on rail.

Main drive • Rail positioning • Coolant pump

Thread cutting and taper turning selection for all heads

New KING® Vertical Boring & Turning Machines incorporate highly advanced, complete electrical controls to give you faster production at lower costs. Controls, listed at left, are conveniently located on movable pendant station and fixed side head panel.

Controls are not the whole story, of course—the All New KING has many other important production-boosting features. Horsepower has been increased to 40 to 50 H. P. on 30", 36", and 46" sizes; 75 to 100 H. P. on sizes 56" and up. Spindle drive provides 24 speeds in any one of three standard ranges: high, intermediate, or low. 24 feeds from .0016" to .250" per revolution are available. Complete drive transmission is mounted in an extra-rugged housing, assuring increased stability. Entire drive is removable as a unit.

Among other outstanding features are . . . new spindle and spindle mounting providing maximum table stability . . . automatic lubrication of all moving parts . . . anti-backlash nuts for all cross-feed movements. Machine is adapted for simple optional addition of: automatic positioning of heads, automatic tracing control of heads, automatic cycling, power rail clamping, power indexing of turrets. For full details see your authorized King Distributor, or write us direct.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

Spot news...

- **These tax law changes have been recommended** by the Cabinet Committee on Small Business: (1) a one-third cut in the tax on the first $25,000 of corporation income, (2) faster writeoff on purchases of used machinery, (3) allowing an estate consisting largely of investment in closely held business firms the option of paying death taxes over a 10-year period, and (4) allowing a few-stockholder corporation to be taxed as a partnership.
- **Nylon air cushions will replace conventional springs in 80% of all autos** produced in or before 1958. That's the prediction of Monsanto Chemical's research VP C A Hochwalt. Auto people say it'll take a little longer.
- **Price of West German machine tools** is expected to go up 3 to 8% because of an increase in special steel prices.
- **Plastic dies for this year's pilot runs on Chrysler Corp cars** are reported to have saved the company "three to four months in production time, and about 20 to 25% in dollars." Also reported: reduction in spotting time; improved accuracy of jigs, fixtures and gates.
- **Crosley and Bendix home appliances will be discontinued by Avco Mfg Corp** because of "over-capacities, price cutting, rising costs of labor and material" in the appliance industry. It's rumored the Bendix line of washers, dryers and ironers will be sold to Philco.
- **Welding wires of diameters less than 1/16 in.** can now join light-gage aluminum, carbon and stainless steels. Production rates are said to be 4 or 5 times greater than with inert-gas, tungsten-arc or flux-coated welding.
- **Nuclear-powered jet seaplane** (probably a version of the SeaMaster) is being designed for the Navy by Glenn L Martin Corp.
- **International Association of Machinists has come out for automation.** Said IAM general VP P L Siemiller in a Chicago speech: "We see that it means lightening of work tasks . . . the long-range effects of the automatic factory will be good for everybody."
- **Independent testing laboratories expect a 20% business increase in 1957,** have already had a similar increase this year. Reason: most plants can't get enough engineers to do major testing jobs themselves.
- **Auto parts manufacturers are busily tooling for other products** because the automakers continue to pull work back in. Reason: economies effected by automation and integration in the auto industry.
- **Heavy wage increases** (much more than the recent 8-10¢-per-hour settlements) are expected to be the 1958 goal of the United Auto Workers. Secondary aims: lower retirement age, a much-shortened workweek.
- **"Building block" do-it-yourself kit for automating the small plant** has 57 gaging and feedback control units for machine tools. Offered by Airborne Instruments Laboratories, Mineola, L I, N Y, the kit will be introduced at the New York Trade Show, NYC, November 26-30.
- **Difficulty in getting new production lines running properly** is said to be the reason why at least one automaker is slow in getting out orders for parts and cutting tools.

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CTW

Continental Counterbores may be purchased individually or in sets. Selection of three sets available.

After the heaviest cuts—they disengage with a twist of the wrist

Continental Counterbores are designed so that cutting torque produces compression rather than shearing stresses. This counterbore never binds—you get quick, easy disengagement after all cutting operations. Anti-wedging action saves time and tools.

Continental Counterbores have double driving lugs on the cutters which engage double abutments in the holders, making a single powerful tool out of the cutter and holder. Double bearings, one above and one below the lugs and close to the cutting edge, guarantee rigid alignment of holder and cutter.

For more information or literature on Continental Counterbores, call your local Ex-Cell-O Representative or write to Continental Tool Works in Detroit.

Continental TOOL WORKS

DIVISION OF

EX-CELL-O CORPORATION • DETROIT 32, MICHIGAN

56-61

Washington ... NEWS REPORT

Election backwash . . .

Ike's landslide win over Stevenson and the return of a Democratic Congress were right in line with the betting. The Eisenhower victory confirmed the major assumption upon which optimistic business forecasts have been based: that the climate in Washington will remain friendly to industry for four more years.

What does a second Eisenhower term in the White House mean to businessmen? This is what the experts are saying:

- **Taxes:** aside from small business relief, tax cuts in 1957 seem unlikely. But if they should come, low-income families will benefit first.
- **Tight money:** don't expect the money pinch to ease up. The brakes were put on credit to keep the booming economy in hand; Washington's money managers aren't keen to ease up so long as the economy continues at record high levels. Interest rates will remain up as long as there's too much demand for available capital.
- **Labor:** employment will stay high—a record 66 million this year and 70 million likely by 1960. Wages will keep moving up. The current record $80-a-week for factory workers isn't expected to stay on the books too long. Many new union contracts call for automatic wage boosts each year. Steel workers, for instance, got a 24¢ hourly wage hike this year; their contract calls for 16¢ next year and 17.5¢ in 1958. Such boosts will spur wage increases for other workers. On the work week, the government won't try to reduce by law the 40-hour week. But there'll be a general union push to cut the work week down to about 35 hours. Some workers, particularly auto, may get it.
- **Cost of living:** the outlook is for the trend to continue upward. In the first 3½ years of Eisenhower's first term, living costs rose less than 3%; but in recent months, prices on nearly all types of goods have gone to record heights. Industry's increasing productivity, heightened business competition, and government monetary policy, however, will work to keep living costs from moving up too fast.

Government budget outlook . . .

Federal expenditures are expected to rise on almost all fronts—defense, public works, other costs of government. Next year's surplus is now estimated to run slightly more than the 1956 surplus of $1.8 billion. But last year the Treasury started out with a prediction of less than a $500-million surplus and ended up with the $1.8 billion. The "around $1 billion" that is now expected could well rise to the magic $3 billion, the figure that both Republicans and Democrats would view as a luxury worthy of paying for a tax cut.

Military and foreign programs . . .

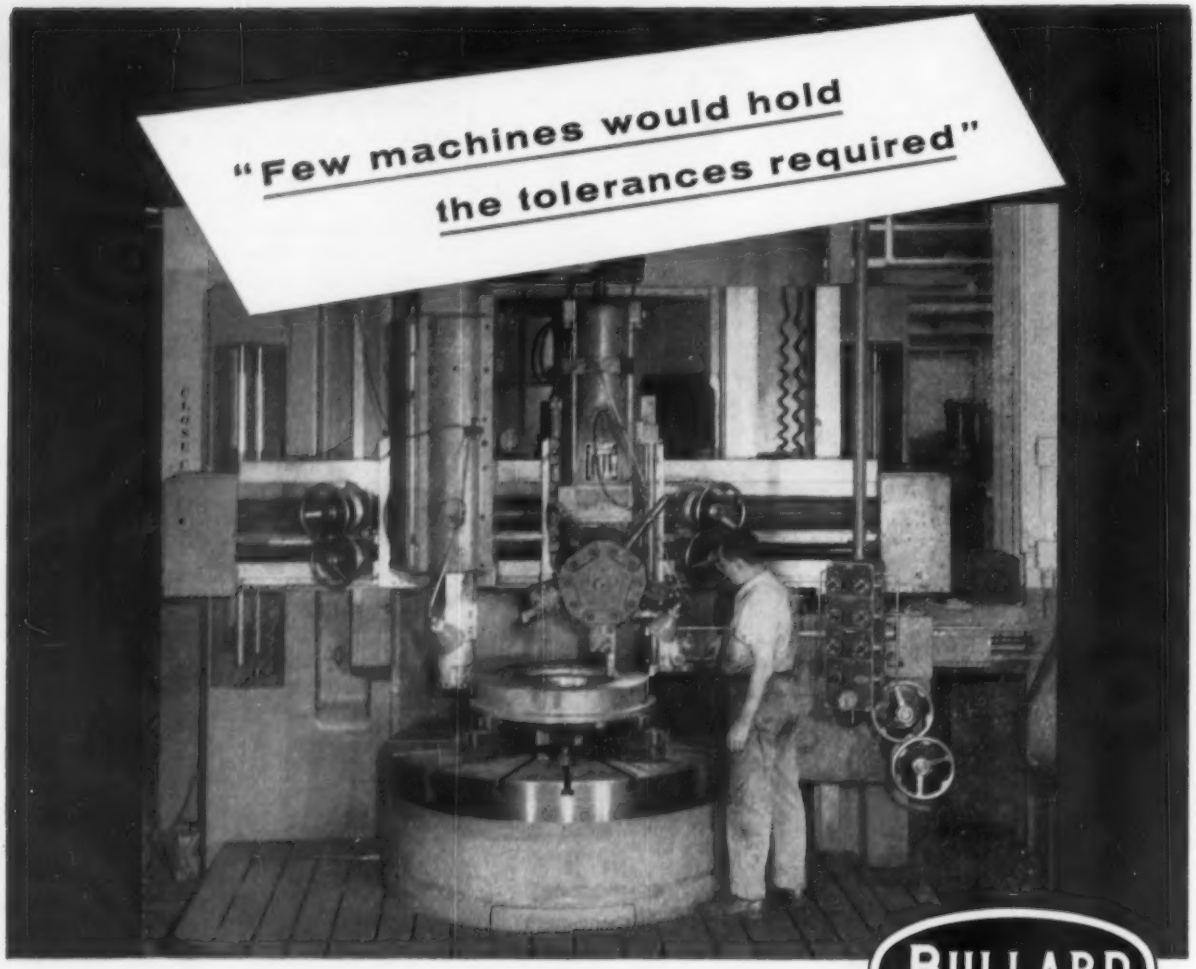
As it shapes up now, the Eisenhower program will call for military spending close to $38 billion in fiscal 1958. This is a 5% boost over the current level of expenditures. Of this sum, almost $13 billion will be earmarked for hard goods procurement, compared to the $11.9 billion worth of military hardware shipments expected this year.

Biggest rise—probably up to 20%—will be in guided missile production, now at a $1.2-billion level, and in electronics and communications equipment, now estimated at $758 million. Aircraft expenditures will stay at about $7 billion. The downward trend in procurement of vehicles, artillery, ammunition, and other conventional military gear, will continue.

The Pentagon expects to reduce the current 2.9-million man force by about 5% in fiscal 1958—mostly in the Army. The Defense Dept's "Second New Look," which is to be a major reappraisal of current strategic policies and a three-year projection of military requirements, was held up pending the election outcome.

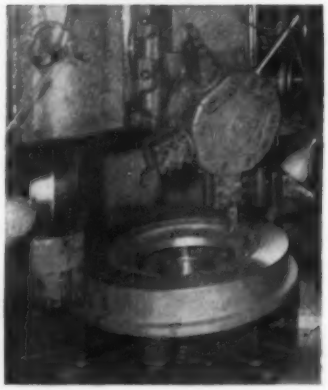
Assuming no fundamental change in either US strategic policy or in the world situation, most Pentagon officials expect defense spending to rise at least $1 billion annually over the next three years. The developments in the Middle East and the Soviet Bloc make it likely that Washington will take a new look at U S international commitments. From this may come an added push to defense spending. But in any case, the outlook for a major cutback in military expenditures before 1960 seems extremely slim right now.

On foreign aid, there are too many unknowns which make speculation about the future pretty crude. The best forecast is that fiscal 1958 expenditures will be about the same as this year—$3 billion for military aid and $1.8 billion for economic assistance. The programs for 1959 and 1960 depend on many factors: the future of NATO, the outcome of the Middle East and East European crises, and—most specifically—the findings of the two big government studies of foreign aid now under way by the Fairless and George Committees.



This statement by Mr. R. P. Feiser, Industrial Engineer of the York Corporation, York, Pa., is one of the reasons for their purchase of a 66" Cut Master, V.T.L., Model 75 for the machining of a rotor support for their turbomatic compressor.

Mr. Feiser further states that "the 66" Cut Master does this machining at a saving of 40% over any previously used machine. In addition, the pendant control and power swiveling turret head are a great convenience in operation — the result is a low operator fatigue factor. Also, the York Corporation has experienced low maintenance costs on a 60" Vertical in operation since 1928 and a 36" Vertical in operation since 1937."



How about You?

Are you employing these same advantages to your machining problems? If not, may we recommend that you get the complete Cut Master V.T.L., Model 75 story by calling your nearest Bullard Sales Office, Distributor or writing for a catalog to

THE BULLARD COMPANY
BRIDGEPORT 2, CONN.

Detroit ... NEWS REPORT

Gatelining gains . . .

As production goes into high gear, engineers are talking new ways to speed up assembly and output. Probably the most revolutionary new assembly method is "gatelining," or, as it is called in some plants, "sidegating." (AM Aug 13 '56.)

Chrysler has followed Mercury's lead and has swung 100% to the gatelining method of auto assembly, and Chrysler engineers say they have no intention of abandoning it until "something a whole lot better comes along." Not only that, the Chrysler people predict the entire auto industry will switch over to gatelining assembly practices just as fast as it can.

Aside from the great gobs of hard cash needed to make the switch, the only thing holding back the universal adoption of gatelining is the relatively long assembly lines and the low ceiling (for conveyors) that it demands. Probably the only holdout against gatelining three years from now will be Ford's Rouge plant, obviously not adaptable because of its high ceilings.

Chrysler engineers claim that gatelining is the only way to build a car so that all openings are true and accurate, so that no secondary fitting of doors is required, and so that ceiling problems "are reasonably reduced to a minimum." What does gatelining mean in terms of cash outlay? It's expensive—there's no doubt about that—not only from the standpoint of tooling, but because of the engineering problems that must be met.

Even discounting plant engineering expenses, Detroit tooling people think gatelining will increase overall tooling expenditures by 20% per year.

Is gatelining, then, worth all the added expense? Yes, auto people say, assembly is much faster, much more accurate, and the resultant automobile is much improved. Not only that, far less repair shop time is required on models' first runs.

As to tooling, the master gateline frames can be expected to last about six years (that's through two three-year cycles) before the stylists change a car so much that frame bed plates become obsolete.

Tooling prospects . . .

"About $90 million" is what Chrysler Corp estimates it will spend on its 1958 models. This figure could be a little on the optimistic side. Some say Chrysler probably wont go over $75 million to turn out moderately facelifted 58's.

But for 1959, the Chrysler group expects to jump its tooling spending well over the $100-million mark—although this hangs on a big "If."

The "if" in question is whether the entire auto industry will follow the three-year model cycle that Chevrolet has underlined. Now, if any one company jumps the gun and swings over to a two-year cycle starting with the '59 models, tooling costs for that year will soar.

So far it doesn't look like any of the automakers will jump the traces, because the auto people believe that the public will buy cars year in and year out even if they're only changed completely once every three years.

As one automotive engineer puts it, "We can give the public a better car if we don't have to scrap everything we are doing and turn out a completely new product every two years. We think the public knows and appreciates that."

Three-year cycles mean astronomical tooling spending for the first model of the cycle, tapering way down for a minor facelift the second year, then back up again as the automakers use a major facelift to get all the mileage they can out of the by-then three-year-old shell.

Truck output will be high . . .

Looking in its own private crystal ball as it introduced new models early in November, General Motors' Truck & Coach Division found the outlook for truck production very bright.

Truck production will roll along at about a 1.2-million clip in 1957, according to the Division's general manager, Philip J Monaghan. And, he says, engineering changes are coming along so fast in truck lines that it's very possible formal presentation of "new" models every year will be discontinued in favor of making running changes as fast as they prove out.

One revolutionary engineering change on GMC trucks this year is the addition of full air suspension to all models. Not only that, GMC is making its air-suspension units available in packaged form to all truck trailer makers.

Service station woes . . .

Gas station operators have been put on the spot by 1957 models. They're finding that virtually none of the Big Three nameplate models will fit car hoists, and that it will cost $68 per hoist for special pads and adaptors.

And worse still, it seems that no "ordinary" bump-and-grind repair shop artist can begin to iron out those enormously complex rear fenders on '57 cars. Fender business should boom.

Five sizes of M & M circular sawing machines cut off stock, ferrous or non-ferrous, from ¼" through 43".
"Own your own". For many reasons—time, production, accuracy, cost—it pays to sharpen your own blades.
Let the Triple-Chip Method make money for you. Segmental type and solid blades 8" through 108" diameter.

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MACHINERY MANUFACTURING DIVISION

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Builders of Automatic Precision Cut-Off, Milling and Special Machinery

Machine tools ... NEWS REPORT

$1 billion a year . . .

A billion-dollar-a-year volume of business, both in new orders and in shipments, is what the leaders of the machine tool industry expect in the years ahead.

Net orders have risen close to that figure in each of the past two years. The total was $927 million in 1955. It probably will be higher than that this year, when the final score is in.

If the nation keeps its financial house in order, the billion-dollar volume "can be the base from which we build in the years ahead," Louis Polk, president of the National Machine Tool Builders' Association, told NMTBA members at their annual meeting.

He pointed out that the industry's shipments since 1950 have grown twice as fast as Gross National Product. And that is no mean achievement these days.

The builders at their sessions at Chicago, like the distributors at their Colorado Springs gathering, voiced a high degree of optimism. They anticipate that 1957 will be much akin to 1956.

With an eight-months' solid backlog, the industry hardly can miss $1 billion of shipments next year. Again bear in mind that recent price increases will help to inflate the figures a bit.

Exports are increasing . . .

Machine tool orders from Canadian and overseas customers have increased year-by-year since 1952, when they amounted to $53.6 million.

The total in 1955 was $80.8 million. This year it is estimated at $101.2 million.

These figures were reported to the NMTBA Annual Meeting by Tell Berna, executive vice president of the Association.

They do not include machine tools of American design built by contractors or branch plants in England and on the Continent. Some 23 U S builders are having their machines manufactured by 34 contractors overseas. And seven builders have nine plants in England and Europe for that purpose.

Ban U S exhibits at Hanover . . .

American machine tools will be excluded from the next European Machine Tool Show to be held at Hanover, Germany, in September, 1957, Mr Berna revealed. However, U S builders still will be able to display their machines at the British show at Olympia, London, every four years through importers who are members of the Machine Tool Trades Association.

Mr Berna informed NMTBA members that a new building has been constructed at the International Amphitheatre in Chicago similar to Exposition Hall.

This added floor space will make available 520,000 sq ft for display of machine tools at the 1960 show. The area is within 3000 sq ft of the space at the Dodge Chicago plant in 1947.

The lease between NMTBA and the Stockyards Company gives assurance that this greatly enlarged area will be available for a Machine Tool Show in 1960, 1965 and 1970.

NMTBA is working with the Radio, Electronic and Television Manufacturers' Association, according to Mr Berna, in developing standards for punch cards, tapes and other equipment with needs of the machine tool industry and machine tool users in mind.

Pool orders increase . . .

Pool order contracts under the so-called Trigger Program now number 81 and cover 15,500 general-purpose machine tools valued at $240 million, J R Robert Jones, Director Metalworking Equipment Division BDSA and sales vice president Kearney & Trecker Corp, reported to NMTBA.

BDSA looks upon present contracts as only the initial phase of the program which eventually must be enlarged to meet the original objectives.

Some 78 machine tool builders are ready to apply for tax amortization certificates totaling $84 million, Mr Jones said. There is considerable doubt, however, that the Office of Defense Mobilization and the Defense Department will go along with a reopening of machine tool expansion goals for defense requirements.

Mr Jones warned NMTBA members that there is an imminent possibility that the legislative gains made in tax depreciation methods (sum-of-the-digits and double-declining-balance methods) may be lost.

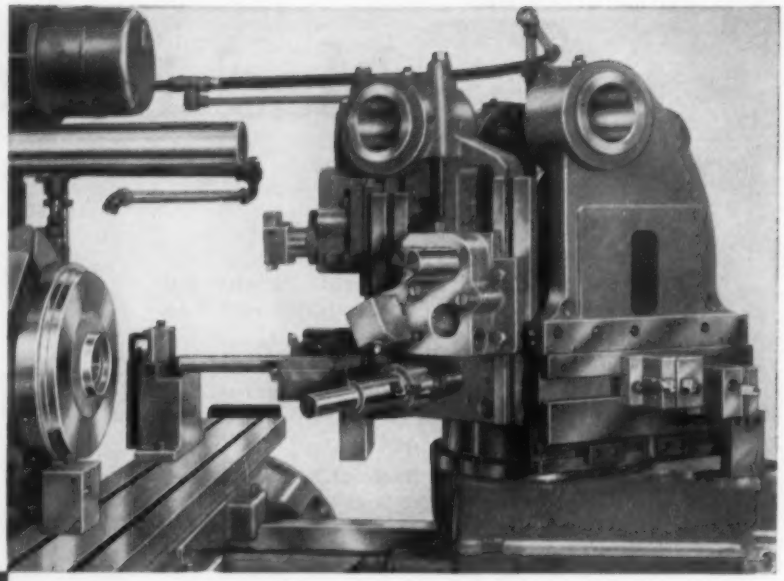
Though present fast writeoffs are a potent force in behalf of equipment modernization, bills have been introduced in Congress to abolish them. They were won in the first place only by a slim margin of votes.

"SPADE WORK" *pays off . . .*

on a

POTTER & JOHNSTON 6DRE-40 AUTOMATIC

with P&J-ENGINEERED TOOLING

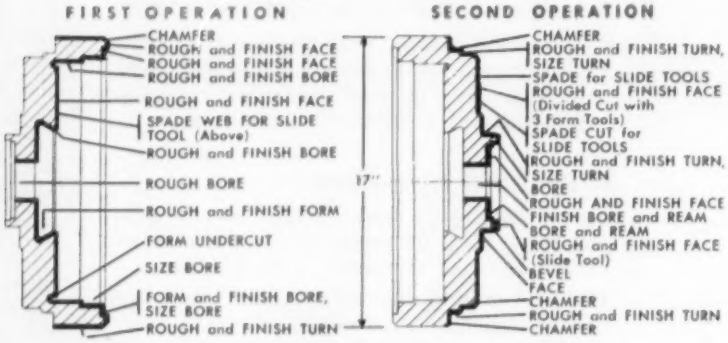


THE PROBLEM –

To machine this hard (288 Brinell) cast iron flywheel . . . requiring *48* close-tolerance cuts . . . quickly and economically.

THE SOLUTION –

Doing the job on a P&J 6DRE-40 Automatic Chucking Turret Lathe . . . with the extra power and rigidity it takes to use fast-cutting carbide tools with real efficiency. And doing the job with P&J-Engineered Tooling (see diagrams) . . . ingenious use of spade cuts followed by divided cuts with 2 or 3 slide tools operating simultaneously finished broad surfaces *fast!* First chucking (22 cuts) was finished in just 14.41 minutes . . . the second (26 cuts) in just 9.6⅝ minutes!



HEAVY LINES INDICATE MACHINED SURFACES

Yes, in *this specific* job, "Spade Work" refers to the spade cuts used in the cost-cutting tooling set-up. But in addition, every time you put a hard-to-machine job on a P&J Automatic, you get the benefits of another, more important type of "spade work." This is the basic research and development engineering that has gone into every P&J Machine . . . gives it the ability to handle tough metals and complicated cuts with cost-saving speed and ease. And it's the engineering skill and experience that goes into P&J Tooling to insure the best possible combinations and sequences for minimum machining time. If you're interested in piling your profits higher, it's time to dig into the facts about a Potter & Johnston 6DRE-40. Write for Bulletin No. 159 or phone the Pratt & Whitney Office near you, and ask a Direct-Factory Representative to call and discuss your requirements. Potter & Johnston Company, Pawtucket, Rhode Island (Subsidiary of Pratt & Whitney Company, Inc.).

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AUTOMATIC CHUCKING TURRET LATHES

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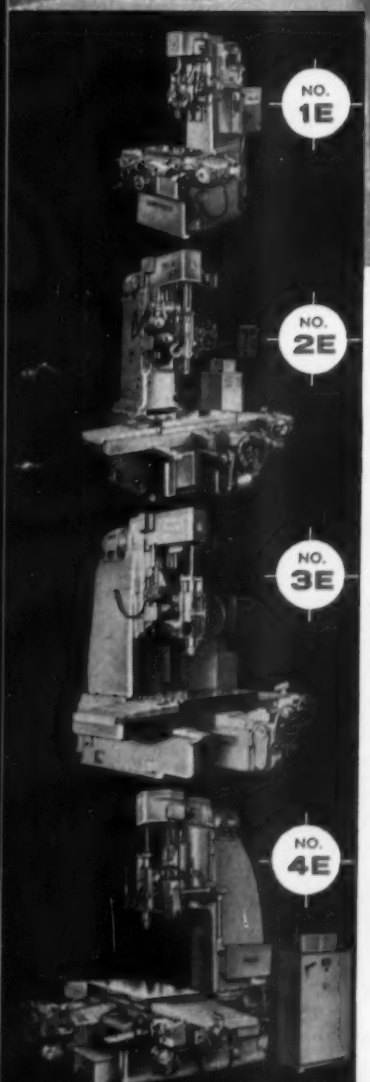

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The point we'd like to make is that Pratt & Whitney Electrolimit Jig Borers incorporate an exclusive method of locating the table that is *unbeatably* fast and convenient . . . and accurate to .0001".
Thanks to the P&W Precision Preloaded Ball Roll Quill, you'll be able to retain original accuracy and rigidity *indefinitely* without any adjustment or maintenance.
And there'll never be any loss of accuracy from wear.

NOW . . . Pratt & Whitney Electrolimit Jig Borers can also be furnished with positioning control by NUMERICAL DATA.

. . . **COMPLETE LINE** includes table sizes from 12"x24" to 36"x72".

Write for free copy of P&W Electrolimit Jig Borer Circular No. 587 . . .

ALSO FURNISHED . . . a full line of Pratt & Whitney End Measure Jig Borers which also deliver "tenths" accuracy year after year.

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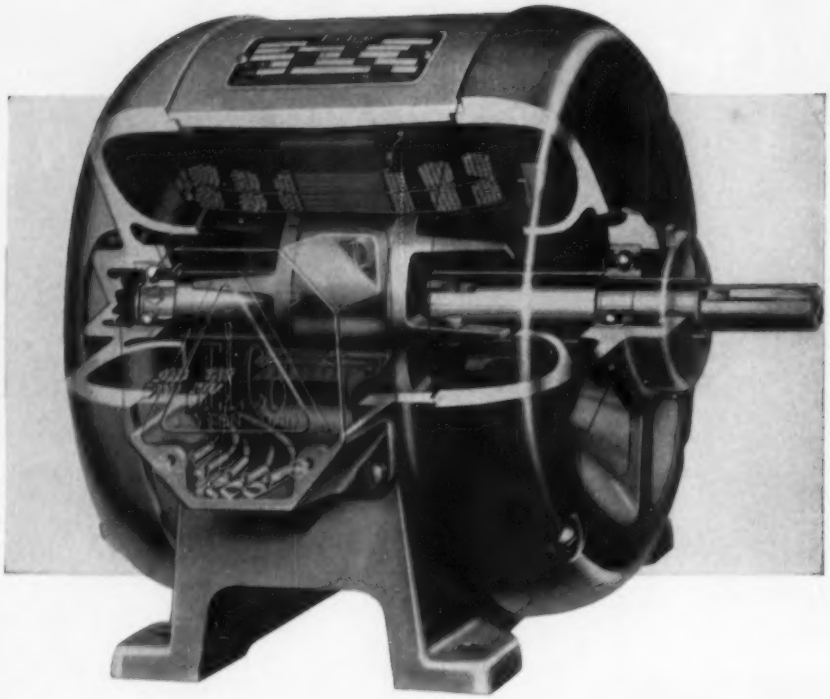
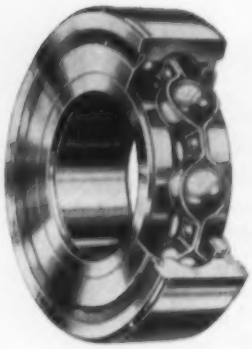


BALL BEARINGS CUT LUBRICATION MAINTENANCE TO VIRTUALLY ZERO



Precision-made New Departure ball bearings assure permanently accurate support of the rotor shaft under all load conditions and mounting positions, plus cool-running, quiet bearings at all speeds.

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NEW DEPARTURE
BALL BEARINGS

GM GENERAL MOTORS

NOTHING ROLLS LIKE A BALL

What's ahead ... in Metalworking

NEWS REPORT

Favorable business climate for '57 . . .

The Eisenhower landslide makes even surer the continuation through at least the first half of 1957 of the current peacetime peak rate of metalworking production.

With Metalworking guaranteed a favorable political climate in which to operate, 1957 looks better than ever for the industry.

For one thing, expenditures for new plant and equipment promise to be high. And they have registered a thumping increase this year over last.

Capital goods producers should have a bigger year in 1957 than in 1956.

Orders have been piling up so impressively that output of heavy goods next year may well tax manufacturing facilities.

Take materials handling equipment. Sales this year have far exceeded the 10% gain predicted earlier. Next year is likely to bring a 10% increase over this year. The same story holds in industrial furnaces, resistance welding and other industrial equipment.

Machine tool industry will do a billion-dollar business next year.

Volume of orders placed by industrial distributors has been increasing the past few months, following a mild slide-off from the April peak.

Defense work will contribute handsomely to metalworking activities next year. Spending for both missiles and aircraft is scheduled to rise. In fact, expenditures for missiles in 1957 are likely to approximate the level earlier projected for 1959.

Industry-by-industry rundown . . .

• Automobiles are moving so well with the advent of the '57 models that the industry is planning to put 80 to 87% of its plants on two-shift operations. At the moment only 57% of the industry's plants have two shifts.

• Farm machinery still hasn't picked up, with 1956 running a good 20% behind 1955. Business may improve now that farmers have snapped out of their "let's wait until the elections before we decide what to do" mood.

• Construction machinery outlook is reported to be "very good" for all of 1957.

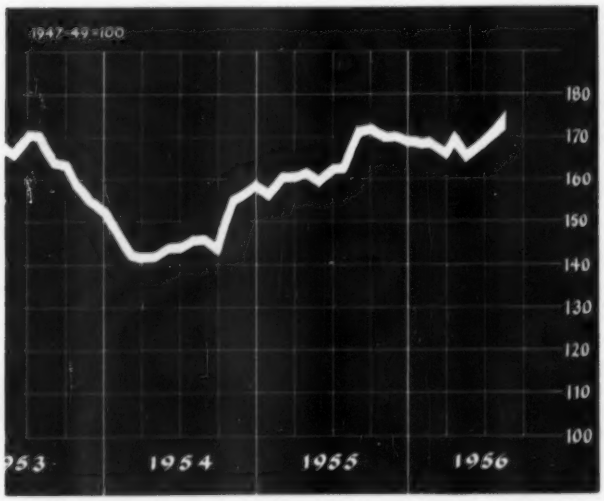
• Railroad car building people have backlogs to carry them at high output through 1957.

• Diesel locomotive producers, too, have enough incoming orders to insure capacity production all through 1957. Exports are growing, too.

• Cutting tools have staged a comeback following an early fall slump, are expected to stay high through at least 3-4 months. Lion's share of output is going to the booming machine tool industry, and to the automakers.

• Tool distributors, reliable business barometers, say sales of small tools, cutting tools, and abrasive products are holding up very well, with tool and die shops, auto parts makers, and small-to-medium-sized machine shops as the biggest customers. Outlook is excellent.

• Steel situation is still tight in almost all product classifications. First quarter '57 order books are filled solidly. Tightest items are still plate and structurals.



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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

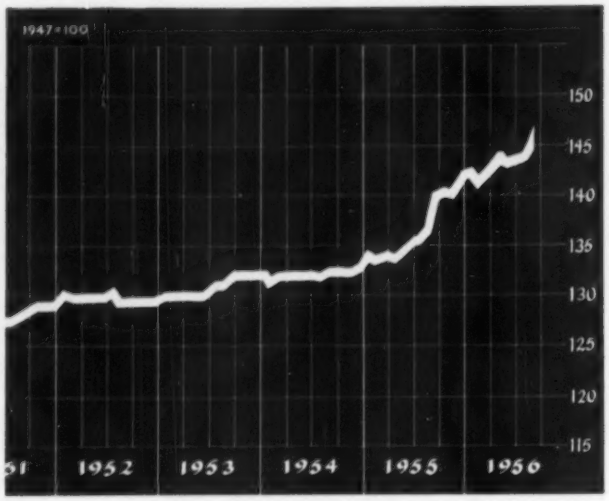
	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**176**	**174**	**173**	**171**
Machinery	**157**	**157**	**141**	
Electrical Machinery	**213**	**211**	**205**	
Autos	**81**	**103**	**133**	
Other Transportation	**392**	**356**	**334**	
Other Metalworking	**148**	**140**	**143**	

NEWS REPORT What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**147.5**	**147.0**	**145.5**	**139.0**
Metalworking Machinery	**170.5**	**167.8**		**156.9**
Other Machinery exc. Electrical	**154.9**	**153.3**		**145.2**
Electrical Machinery	**146.1**	**143.7**		**136.0**
Fabricated Metal Products	**139.6**	**138.5**		**132.9**

147.5



'57 looks good from here . . .

Now that the elections are over and business has stopped marking time awaiting the outcome, what are the general prospects for the coming year?

The Survey of Consumer Intentions carried out recently by the Michigan Research Center indicates that buying of consumer durables will fall off somewhat next year. But it's quite possible that the consuming public will change its mind by that time and we'll buy more hard goods than ever.

There's good reason to believe so. Just look at consumer income: it's running at an all-time high of about $329 billion. And if auto sales are an indicator, '57 will be a top year.

Business investment in plant and equipment is also hitting a high water mark. The fourth quarter of this year should find business purchases of plant and equipment running along at a seasonally adjusted annual rate of $38 billion.

And even though money is really tight, there appears to be little slowdown in the offing. One reason for that is that the big spenders aren't feeling the tight money pinch much.

You can look for government spending to rise—no matter who controls Congress. Federal, state and local expenditures totaled $78 billion at 1955's end. They'll be running at an annual rate of $81 billion at the end of this year. The end is not in sight. In fact, this looks like the beginning of a prolonged rise in government spending, and by the end of next year government spending should have risen by at least $3 billion.

And although business profits have dropped off, look for higher prices and renewed business activity to offset this early in 1957.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	149.1	149.4	147.1
Steel ingot operations (thousands of tons)	2,476	2,493	2,404
Electric power output (million Kilowatt hours)	11,487	11,391	10,853
Production of automobiles and trucks	145,207	133,132	199,950
Engineering construction awards (Eng. News-Record—millions)	$281.0	$350.1	$267.9

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$413.0	$408.3	$396.8
Expenditures of new plant and equipment (millions)	$38.00	$36.26	$31.45
Profits after taxes in primary iron and steel industry (millions)	$397	$376	$345
Profits after taxes electrical machinery industry (millions)	$193	$163	$173
Profits after taxes machinery (except electrical) (millions)	$392	$321	$298
Profits after taxes in motor vehicles and parts industry (millions)	$315	$400	$578
Motors and generators new orders index (1947-1949=100)	253.0	224.0	185.8

* Seasonally adjusted

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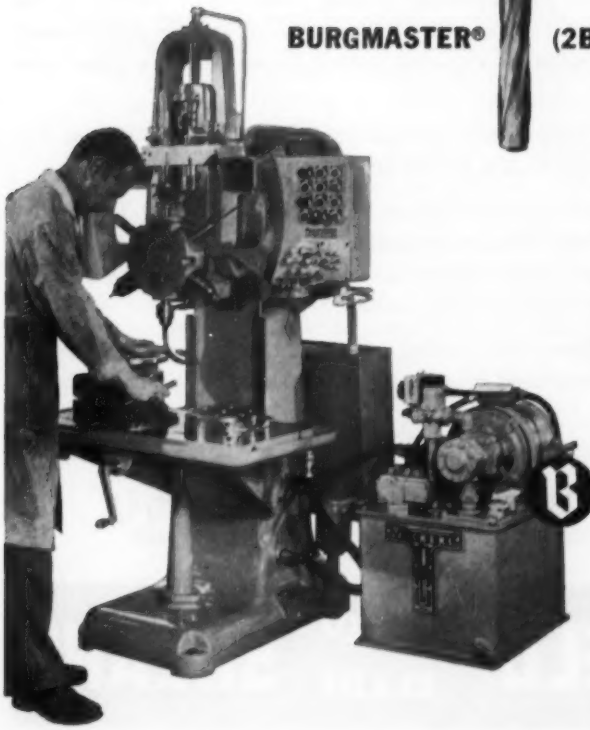
simple controls • automatic cycling (easily tied in with auto index tables, positioning tables and index fixtures) • quick setup • infinitely variable preselective feeds • preselective spindle speeds • preselective, extremely accurate depth control • preselective length of rapid approach • 8" stroke • ¾" drill capacity in mild steel • all controls within easy reach of the operator • little floor space required • performs any second operation • extremely accurate relationship of one spindle to another • simple jigs required.



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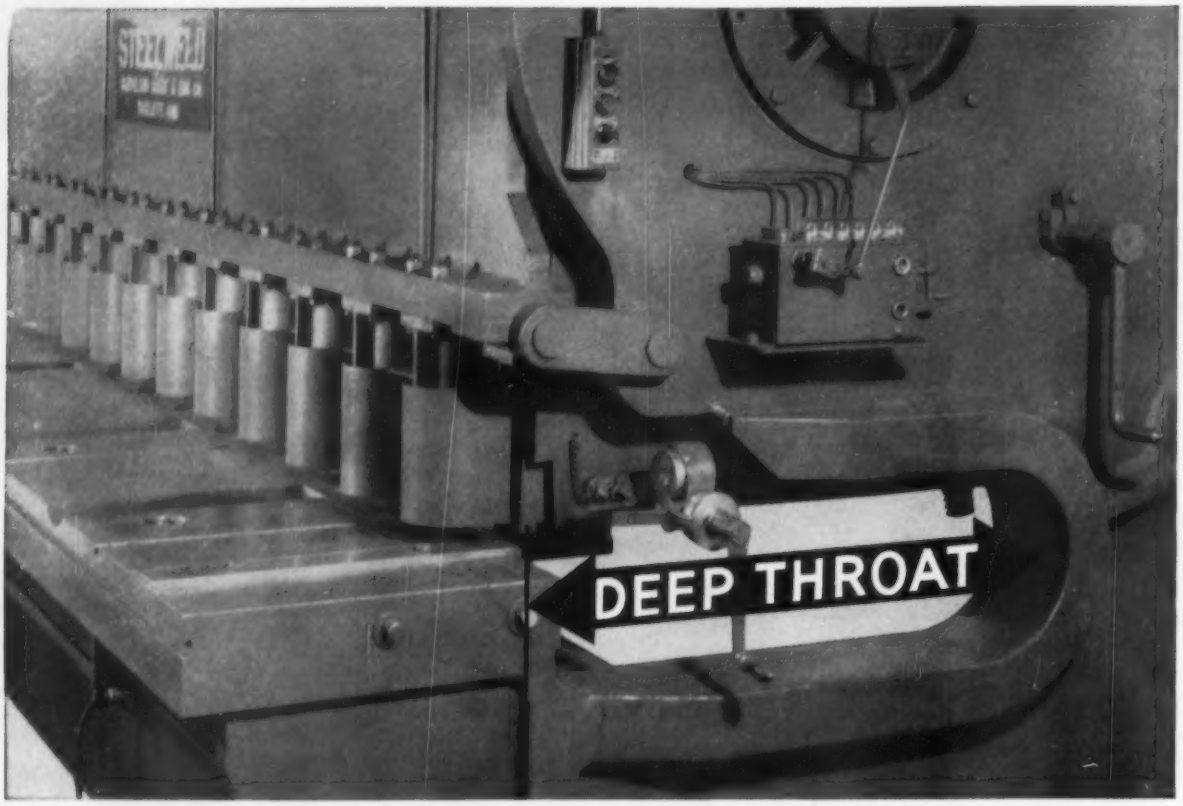
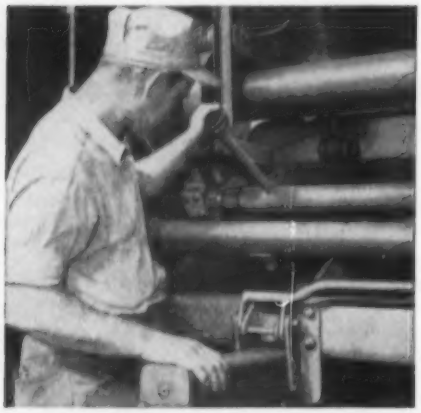


WIDE SHEETS EASILY SLIT



Steelweld Shears are built for cutting steel plate in thicknesses of ¼ to 1½ inches and in lengths of 6 to 26 feet.

Throat depths of 24 and 36 inches make it easy to slit wide sheets on Steelweld Pivoted-Blade Shears. Twenty-four inches is the standard throat depth for all machines. Thirty-six inch throats can be provided as a special feature for many of the larger size machines.

With such deep throats it is possible to slit plates of 48" to 72" wide down the middle for any length.

It is a simple matter to adjust the blade for slitting. The easily-reached slitting adjustment shaft is turned by a spanner wrench as illustrated. When adjustment has been completed a locking device holds it securely in position.

Steelweld Shears are loaded with exclusive features that make operation easier and speed production. There are no other shears like them.

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STEELWELD PIVOTED BLADE SHEARS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Don't Count Out The Little Fellow

You read and hear a lot about the big fellows gobbling up the little fellows these days.

It appears to be . . .

common opinion that the American economy is trending toward a smaller number of larger companies. But more than that, our politicians have been weeping copiously over the terrible plight of the little business man. "Poor guy," they say. "What can we do to save him from obliteration?"

Well, the incompetent little fellow can't be saved and probably shouldn't. To try to keep him alive would be equivalent to pouring money down a drain.

But what about the little fellow who is doing all right? He is not alone. He has plenty of company, right in Metalworking.

The Formsprag Company of Van Dyke, Michigan, is a prime example. Back in 1946, it introduced a revolutionary type of free-wheeling clutch employing sprags. Acceptance came quickly; and today much of what Formsprag designs, engineers and manufactures goes to large companies.

Formsprag's management is not afraid of being swallowed up by big business. In fact, it feels that its strength lies in its ability to provide a better product in a specialized field than its big-company customers can produce themselves.

Then there is the case . . .

of the two partners who formed a company to build just one type of machine of very simple design and sell it at a very low price. Success came fast. The company had orders on its books for 4000 units at a time when much larger companies making bigger machines of the same family were sweating for business. And it is doing all right today and promises to do all right in the forseeable future.

It is possible to go on reciting case after case of small companies that are big successes. No doubt you know of some yourself. In the end, however, the matter of whether the little fellow is going to town or to the cleaners' is a simple one.

He must perform a service or make a product that people want. And, in general, the service and the product should be specialized. Moreover, it may well be that the service or the product is what the big companies want and need.

Before you get out the crying towel . . .

on behalf of the little fellow, remember that scarcely any big business can go it alone. "Big business needs the help of little businesses," Formsprag's president, J Lawrence Buell, Jr, points out. "Complex, dynamic and constantly improving though it is, big business is not, and never is likely to become self-sufficient."

So let's not be too hasty in counting out the little fellow and rushing to bury him and put up a gravemarker for him. He still has plenty of opportunity to make a go of it.

What's more, the little fellow who really knows what he is doing does not need to be shored up by government money or help. He is fully capable of conducting a successful business on his own. He is in no danger of being gobbled up by the big fellow—unless he deliberately chooses to.

Burnham Finney EDITOR

ACCURATE BLANKS for

all these products are produced on

Cincinnati Shears

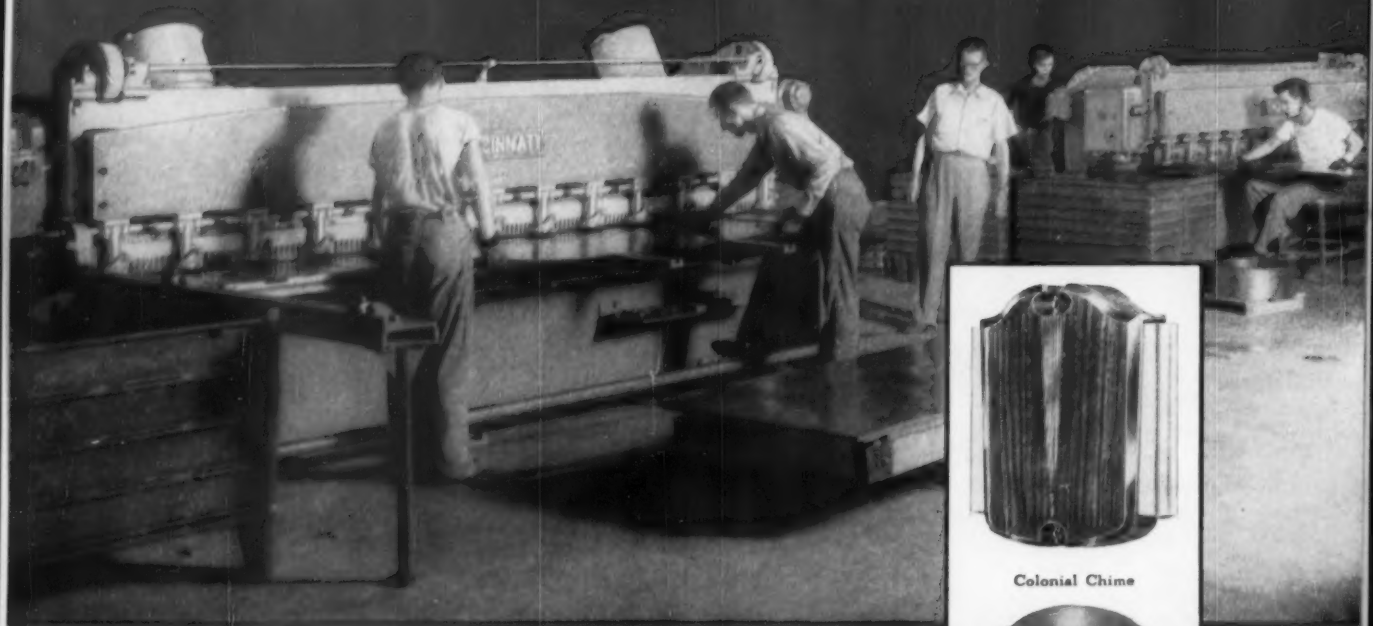
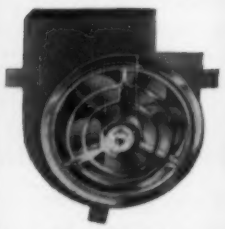


Photo courtesy Nutone, Incorporated, Madison and Red Bank Roads, Cincinnati 27, Ohio.

Colonial Chime

Electric Ceiling Heater



Ventilating Fan

Accurate blanks and strip stock of many sizes are sheared on these Cincinnati Shears at Nutone, Inc. The shearing operation eliminates costly dies, is flexible, rapid and economical.

One hundred and seventy-five tons of light sheets are sheared a month. Press operations are speeded and spoilage is at a minimum. The flexibility of the shearing operations take care of new products or changes in design with no tooling or special costs. Investigate these accurate Shears.

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Report on RUSSIA

PART 1 . . .

From revolution to automation in 37 years

What is the metalworking state of the Soviet Union? Are the Russians ahead of us or behind us in technology, in production, in the use of automation, in new developments like ceramic tooling and electrical-discharge machining? Now, for the first time in any American publication, *American Machinist's* own editorial team, which even now is touring metalworking plants in the Soviet Union, brings you the first of a continuing series of authentic on-the-spot reports designed to keep you abreast of the newest developments in the phenomenal growth of Russian industry. Every word of this is based on first-hand observation.

MOSCOW—Automation and still more automation is the front-runner in the impressive upward surge in Soviet Russia's production and in its technology.

This young nation that 25 years ago had *no* machine tools is coming up fast in the race for world leadership in Metalworking. What's happening in manufacture of aircraft, agricultural machinery, automobiles, machine tools and heavy capital equipment of all kinds is convincing evidence that the Russians have been working around the clock to industrialize as fast as possible what has been, and to a great extent still is, an agrarian nation.

The USSR has just completed its fifth Five-Year Plan. Its industrial expansion goal, a very ambitious one, was attained ahead of schedule. Russia is now in the early stages of its sixth Five-Year Plan, which spells out a further massive expansion of industrial facilities by 1960.

In order to understand better and appreciate more fully the vast significance of what is going on in Russia's metalworking industries—its amazing development up to now, and what is likely to happen in the years ahead—one must bear in mind exactly what kind of a job faces the Soviet leaders.

Russia, as an industrial nation, is unique. Its government has to administer an area of more than eight-and-one-half-million square miles—three times the area of the United States, four times that of all the countries of Western Europe put together, and covering one-sixth of the inhabited land surface of the earth. Russia has more

than 200-million inhabitants, and the birth rate is increasing.

Less than four decades ago, at the time of the Revolution (1918) the great mass of the Russian people was illiterate. In fact, some of the remote national groups that were to make up the USSR had no written language at all. Against this, Russia had always had a nucleus of pure and applied scientists (notably mathematicians) of world renown. No industrial development would have been possible without that nucleus.

Those are the basic facts we must know if we are to appreciate both the achievements and the shortcomings of today's Soviet industrial expansion.

It is for instance, clearly more realistic to consider Soviet industrial development in terms of *rate* of progress rather than judge figures for production of capital equipment, heavy industry, and so on, at their face value. The latter are impressive, it cannot be denied. But the rate of development is staggering, when it is appreciated that the present day program has been built up in a handful of years from a predominantly peasant population with no technological knowledge.

SHORTCOMINGS ARE EVIDENT, TOO

That there are many shortcomings cannot be doubted—some of them are there for all to see. Even in Moscow itself, once one leaves the hotel, houses of extremely low standard are evident, and, during a car trip a bit further out, we noted that the large new building projects were soon replaced by evidence of even lower living conditions—approaching squalor—with some wooden shacks in the most delapidated condition. Many houses also were in a bad state of repair.

Against this, there are new groups of "multiple unit" houses going up; but even these (or at least, those we have seen to date) have sheet metal roofing. Whether this is typical or not, it is impossible to say in this introductory report, and it would not be fair to judge by the evidence of a single short tour outside Moscow. Neither does housing yet seem to be ideal even for the higher executive.

For what it is worth, we quote an American visitor who was in Moscow at the same time as ourselves. He told us that he had visited the "director" of a works in Leningrad with his son, and was astonished to find him living with his family in only a two-room apartment. Clearly the pressure of the program has caused hardships. Clearly, also, it has achieved spectacular results.

Moscow is a city of contrasts. One of the most impressive sights in the city, for instance, is the 500-acre United Soviet Agricultural and Industrial Exhibition. In this permanent display, the Soviet has a strong morale booster. Here is a remarkable presentation of the best of Russia's achievements. And, above all, the exhibition serves as a cultural center in which the many nationalities and types of people represented in the USSR can meet with each other.

Here, too, they can study the latest methods, techniques, and products. Engineering equipment is proudly featured—with machine tools allocated a prominent and attractive "palace" to themselves.

There can be no doubting the value of this exhibition, and we shall be describing the exhibits in greater detail later on. The cost must have been fantastic—and with the appalling state of some of the living quarters in and around Moscow, one might well wonder what sacrifices paid for it.

In no other country we have visited have we seen anything quite like this great park, with its beautifully laid-out grounds and, most important, the individual "palaces", many of which are in the characteristic style of the territory they represent. Each displays its products, indicates the scope and scale of its activities, and workers from the different states sent to Moscow on short study courses take in visits to the exhibition as part of the course. The display in the Machine Tool Palace is extensive and impressive.

Naturally, with the Soviet policy and power to implement rationalization, the competitive element as we know it is absent, although there was some evidence that lack of competition was compensated for by the enthusiasm it generated and inspired. It must be added, however, that such evidence is not very concrete. Certainly, everything possible is done to boost morale and stimulate keenness, and we met many people who had great confidence in "the system" and were working enthusiastically to further their own advancement both technically and academically.

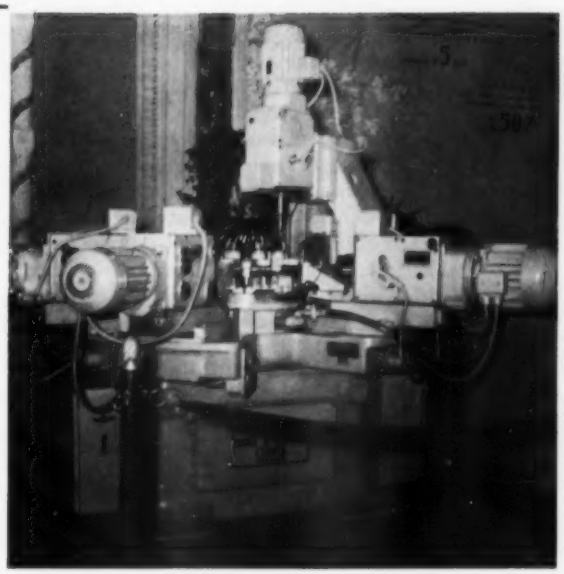
PRIORITY FOR HEAVY INDUSTRY

Automation is literally at the forefront, not only at the Machine Tool Palace, but, more significantly, in the present Five-Year program. Soviet preoccupation with automation can, of course, be traced back to historical necessity—it is a natural development in building up a powerful industrial potential starting from a population which was entirely unskilled technically. Such conditions, we believe, make first for mechanization, secondly for automation in various forms, and finally for highly complex integrated lines—an entirely inevitable development.

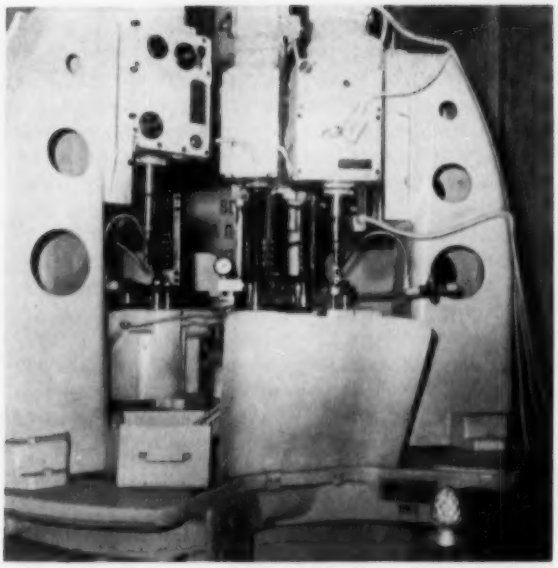
The trend has been consistent and has grown progressively from the early days of Soviet industrial programs right up to the present time—forced by an inescapable necessity to "de-skill" the work and put all the skill into the machine. This policy, has clearly been an indispensable factor in attaining the present industrial output.

Automation is simply one more aspect of a fundamental principle that has been energetically pursued ever since the Soviet came into being. Throughout the history of the Soviet, it has been emphasized that the development of heavy industry is a prerequisite for raising the country's production forces and for transforming it into an economically powerful state.

To quote Marshal Bulganin in his report to the



Two Soviet-made rotary indexing machines . . .
This one has nine heads and nine spindles to drill three holes of 6.6 mm and 8.8 mm. Head traverse is 120-150 mm. Motors are rated at 10 and 15 kw. Output of components, which are hand-clamped, is 280 an hour. Heads are electro-mechanical



This Russian-built rotary indexing machine spotfaces and taps a hole in a small universal-joint spider. This unit centers with a 20-mm drill, spotfaces with end mill, drills and taps 8.7 mm dia

20th Congress: "As hitherto, the leading role in the department of the socialist economy will be played by industry—primarily by heavy industry, the production of means of production." The latter phrase might well be taken as a slogan for the present Five-Year Plan—and, indeed, for those that preceded it. It is certainly evident in the figures for the Plan itself. As far as implementation is concerned, it is also evident in the organizations, not only in factories themselves, but in the remarkable bodies set up for research and development in machine tools, cutting tools, instruments, and so on, of which we shall say more later.

At this stage, it is sufficient to say that, in our experience, these organizations are on a fantastic scale and are quite unlike anything we know in this country. It is also, of course, evident in Russia's technological training program.

NO MACHINE TOOLS 25 YEARS AGO

Before appraising the problems to be overcome if the Soviet program is to be fulfilled, it is necessary once again to consider the Soviet machine tool industry in its proper historical setting, because, here too, it is only by appreciating the *rate* of development that the plan can be seen in its correct perspective.

One way of illustrating this is to consider the growth of a factory which we visited in Moscow. We are not in a position to compare this plant with others in the Soviet as we have not, at the time of writing, this report, had the opportunity of visiting others, but its history of development is broadly the history of development of machine tools in the Soviet Union.

This plant, the Ordzonikidze Machine Tool Factory, was built in 1930-1932. This date is significant, for, previous to this, there had been virtually no machine tool building in the Soviet at all. Thus, the present potential of capital equipment in the Soviet has been built up from scratch in only 25 years.

The Ordzonikidze plant employs 3500 people. Initially, its activities were not confined to machine tools. The policy at first was deliberately to copy foreign machines in order to get into production quickly without having to call on design resources which were not available. Russia turned to America for the pattern: started building turret lathes of 65-mm bar capacity which were direct copies of a Warner & Swasey machine. In 1934 Ordzonikidze produced its first semi-automatic multi-tool lathe—a copy of the Fay automatic. In 1937 came the first multi-spindle automatic—a copy of the Cone machine.

With these machines as the base, Ordzonikidze built up experience in the shops and the design office. These were the only three types of machines made until the beginning of World War II when Russia modernized and improved tooling. War production, however, still remained on similar lines with some special types added.

After the war, some interruption was caused by need to reconstruct war-damaged factories but, this completed, Ordzonikidze introduced unit-head production machines. Ordzonikidze now makes 11 unit heads in different models and sizes, based on three types. In the same period (1946 to 1948) the plant

also did modernization and experimental work on its own automatics.

Production of automatics of original design and construction, in addition to semi-automatic machine tools, started in 1950-1952. Power was increased, and speeds raised. Design was considerably modernized, and features included constant cams and adjustable linkage, lifting of the drum when indexing, mechanized motor of the camshaft in setting, and mechanized swarf clearance. Semi-automatics now feature 60 kw motors and maximum speed has been increased from 230 rpm to 1300 rpm. A smaller model has had its maximum speed raised from 320 rpm to 1300 rpm. One multi-tool machine we saw has 200-mm-dia capacity, with maximum speed of 2000 rpm. It gives four automatic cycles, which the plant considers adequate.

We were told that six cycles would be considered too much, since it would indicate that too much metal was being removed. The latter point is of some interest. Such a practice comes under the category of "uneconomical usage," and is directly in line with the directive for the Five-Year Plan, wherein economy of metals is emphasized.

Machine tool designers are called upon to lighten machines as much as possible without impairing their operating efficiency and, in all industries where it is practicable, to look for substitute materials.

There is much skip turning on the smaller machines. Two automatic speed changes are provided. The actual feed is also constant in copying—that is to say the geometric sum is constant, the vertical and horizontal feeds related.

The same plant is also making a special vertical boring machine for roller bearings, and has already built a large floor-plate boring machine which is now somewhat out of date but is in process of being redesigned.

TRANSFER MACHINE MAJOR FEATURE

Compared with the original three copies of 20 years, ago, the major feature of Ordzonikidze production is now transfer machines, which have been in production since 1948. These are heavy machines. It was noted that the plant is today turning and grinding on its transfer lines, notably on pistons, rings, electrical motor shafts, and so forth. In turning rings and pistons, and also gears, vertical spindle elements are used.

Several machines were seen in course of construction, including a large duplex machine for cylinder heads in which substantial broadly-based heads were provided for milling cuts, and in which provision was also made for manipulating the heads automatically, turning through 180°, and so on.

Another indication of the progress made by this plant in 22 years: initially it had 15 to 20 designers. Today, there are several separate design offices for different machines and, altogether, 400 designers and draftsmen are employed.

The shops are quite well laid out, with plenty of space in the aisles, but the assembly bay is cramped. The floor is firm, but again some sections of the assembly bay are not so good. Those concerned are aware that there is room for improvement and do not appear to be sensitive about it. The engineer we were talking to appreciated the point when we told him that we liked his machines but not his floor! They also have minor troubles with undesirable workshop practice, of a type, it should be said in fairness, with which we are not unfamiliar here. The same engineer grimaced when he saw that we had noticed a young fitter using a file as a punch.

In the plant itself, most of the items are imported—some are pre-war and others wartime acquisitions. Very few of the machines we saw in this plant seemed to be post-war. Among those noted were two Butler planers and a whole battery of medium-sized Billeter & Klonz machines. There was a Kendall & Gent miller, a small Cincinnati (British built); a Beliot-Gray planer-miller (this was one of the few post-war machines); a fairly elderly large Giddings & Lewis floor-plate horizontal boring machine; Milwaukee millers; a Girards radial and a Wotan grinder.

RUSSIAN-BUILT MACHINE TOOLS

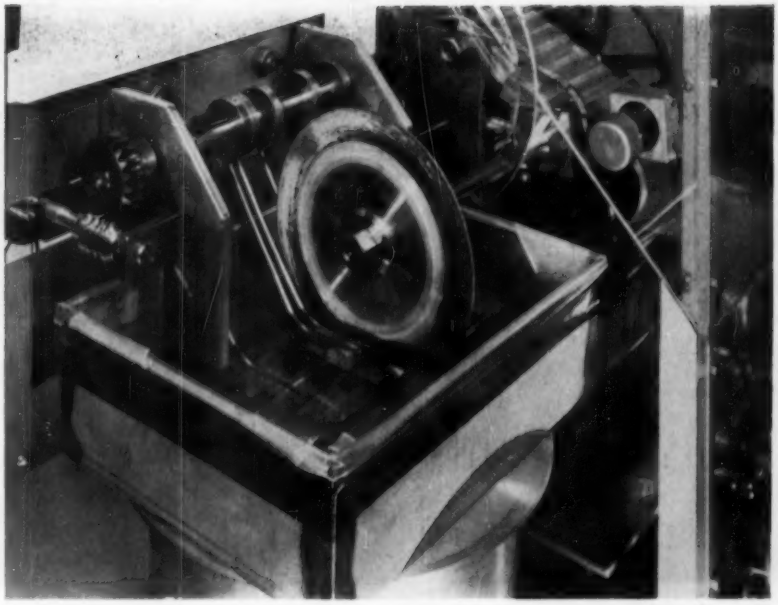
But, lest it be thought that Ordzonikidze is entirely equipped with imported machines, it should be added that the Russians are also taking some of their own medicine. In the turret lathe section we noticed quite a few copies of Warner & Swasey machines, but we did not see any Russian-built copying lathes.

There are some important Russian machines in the plant, notably a large horizontal boring machine, built in Leningrad and of the very latest type; and a large and a medium sized planer—both looked good. The Soviet planer had a table 2½ meters by 10 meters. The borer had all electro-mechanical controls, no handwheels, and amplidyne drive. In addition we saw a fairly new Soviet spiral bevel gear grinder and others for spur gears. There did not seem to be really anything out of the ordinary about this equipment but, on the whole, it was in pretty fair condition. We were told that a particular point was made of maintenance.

Tooling and methods in this plant were generally conventional, with emphasis on carbide tooling. Although ceramics were noted elsewhere there were none here. A home-made induction heater was in use for hardening gear teeth.

As far as the rate of working was concerned, there was certainly no rush and tear about the place and, unless efficiency deceived, one would say that the pace was not as fast as in the best British and American shops.

As one of the founder machine tool factories in the Soviet, this plant has consistently developed along a typical pattern, and is geared to take its place in providing machine tools based on up-to-date design principles which will doubtless play their part in implementing the Five-Year Plan.



During sawing operation . . . pan containing dielectric coolant is raised to submerge workpiece. Vise arms rotated by shaft behind cutter spindle hold workpiece in groove in vise baseplate. Vise assembly is insulated from rest of machine, and anode electrical connection is brought to it through the clamping shaft. Fan ventilates work area

Electrical-discharge saw cuts 'HOT' metal

Rotating-disk cutter cuts a variety of metals by remote control.

Special unit makes decontamination easy.

FRANK BEVILACQUA remote control engineering division, ARGONNE NATIONAL LABORATORY, LEMONT, ILL

Test samples are cut from radioactive metal specimens with slowly rotating 6-in.-OD, 1/16-in.-thick metal disks inside shielding "caves" at the Argonne National Laboratory. Cutting is accomplished by electrical-discharge machining (*AM*—Mar 3 '52, p136, Mar 15 '54, p137, and Apr 23 '56, p113).

Part of a continuing program by the Remote Control Engineering Div and other sections of the Argonne National Laboratory to develop efficient, easily decontaminated, remotely controlled equipment for use inside shielding caves, the simplified sawing machine used for these cuts has proved very satisfactory.

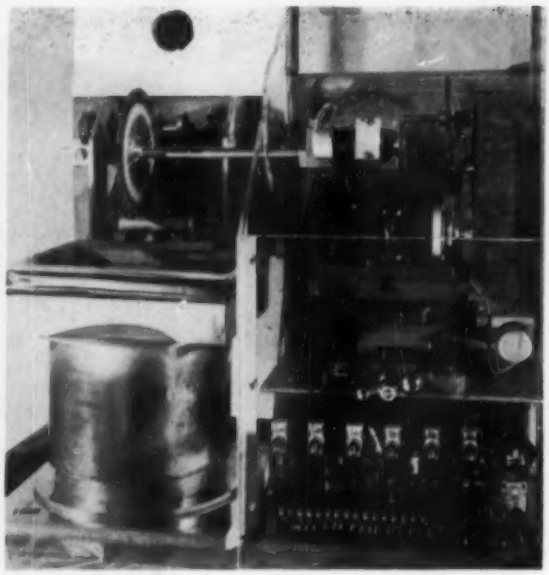
The machine itself is placed on a caster-equipped cart, for easy movement, and is housed in a two-compartment, Lucite-enclosed cabinet having hinged covers that can be opened with manipulators. It is connected through cave walls by electric cables with a commercial Elox power supply, and with a small switch cabinet for manual remote control.

A rotating-disk cutter eliminates need for a dielectric-pumping system, that would be necessary to wash away the metallic particles if a stationary cutter were used, as well as to minimize the amount of fluid needed.

The vise consists basically of a stainless-

Electrical-discharge saw cuts 'HOT' metal

Practicability . . .
of using electrical-discharge machining techniques in radioactive caves is being tested with this simplified sawing unit (left) devised by the lab's Remote Control Engineering Div. Power supply is a commercial Elox unit (right) with remote controls for machine adjustments in box on top



Sawing unit . . .
is assembled in two plastic-enclosed compartments on top of cart. Right-hand compartment contains motors for driving the cutter spindle, feeding the work to the cutter disk, and indexing the cutter horizontally. It also contains switches and condensers for controlling arc-discharge energy. Saw unit and coolant pan are at left

steel base, with a groove in which the V-blocks or other specimen-locating devices can be placed, and a number of stainless-steel hold-down fingers extending from a worm-and-gear controlled shaft operated by a manipulator from outside. The vise is insulated from the rest of the machine, and is positioned so the vise base and specimen to be cut are submerged in dielectric fluid when the pan below is raised to working position.

Pan holding the dielectric fluid is smaller than the compartment, so air supplied by the fan of a self-contained ventilating system will flow around it.

A flexible polyethylene plastic lining is placed in the pan before it is filled. This both (1) protects the vise from being shorted to the base of the machine, and (2) simplifies disposal of radioactive particles left in the pan by cutting.

Satisfactory operation depends upon the use of a metal cutting disk with less than 0.0005-in. eccentricity, and with less than 0.0005-in. runout or "wobble." Larger eccentricity and/or runout causes unwarranted servomotor operation and slows down the cutting action severely.

Under normal conditions, if the cutter is true at the start of a cut, it will remain true throughout the operation—because electronic controls prevent its contacting the workpiece.

During a cut, the disk is worn away at rates depending on the metal from which the disk is made, and on the characteristics of the metal being cut. Approximate cutter/workpiece wear rates (data from Elox Corp of Michigan, and confirmed by test cuts on several specimens) are:

Work Material	*Cutter*	*Work*
*Aluminum	1	15
Copper, Brass, Bronze	1	2
*Steel (Stainless)	1	1
*Steel (Tool)	¾	1
Stellites	1	1
Tungsten Carbide	3	1
†Uranium	1	2

*Values checked at Argonne National Laboratory.
†Value established at, and added by, Argonne National Laboratory.

Other cutter materials may have better cutter/workpiece wear ratios, but they may be more expensive in terms of cost per cut. A 3-in.-OD, 1/32-in.-thick tungsten (Hevimet) disk has been tested, with these wear-ratio results:

Stentor Steel: cutter, 1; work, 8.5.
Normal Uranium: cutter, 1; work, 9.

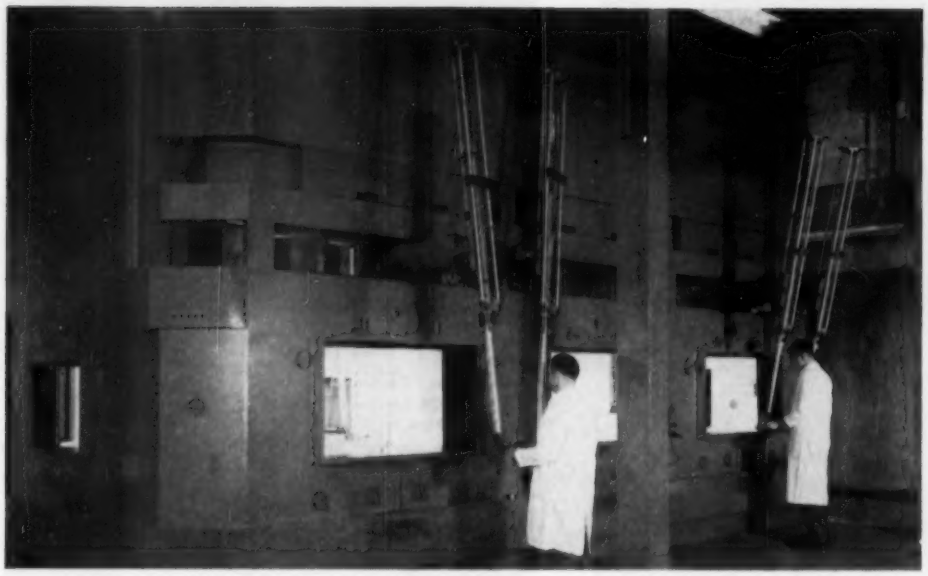
Studies of other disk materials are contemplated.

RESULTS OF TEST CUTS

With this apparatus, a number of experimental cuts were made on various non-radioactive metal specimens, including normal uranium. The cylindrical specimens were ¾-in. in dia, except the uranium specimens, which were ⅝ in.

Operating characteristics were studied, as were the possibilities of using different dielectric solutions, and the effects of the electrical-discharge cutting process on the metals being cut.

Transformer oils, silicone oils, carbon tetrachlor-



Radioactive materials must be machined . . .
in shielded "caves" to prevent radiation injury to laboratory workers. Machine tools are arranged for remote control with mechanical manipulators and/or electrical cabinets located outside. Hooding is used where possible to minimize contamination

ide, and distilled water were tested as dielectric solutions. The oils, because of their high resistivity to flow of electric current, are very satisfactory, and continue to function without filtering even after the oil has become quite dirty.

Transformer oil is recommended by the commercial supplier of the process, and is relatively inexpensive. However, under operation, this oil breaks down, forming a carbon sludge and releasing hydrogen.

Silicone oils tested (Dow Corning 200-3CS) performed as well as transformer oil and appear to be more stable, forming less sludge, and can be obtained in low-viscosity grades having a fairly high vapor pressure. This may prove to be desirable, as far as waste disposal is concerned. Silicones, however, have the disadvantage of being extremely hard to remove, and are much more expensive than transformer oil.

Carbon tetrachloride was tried because of its high vapor pressure and ease of disposal. It, however, breaks down rapidly under the electrical-discharge cutting action, releasing chlorine, phosgene, and a carbon sludge. This liquid is considered undesirable as a dielectric fluid because of ventilation requirements, the corrosive and poisonous nature of the gases released, and the chemical actions involved.

Distilled water is considered especially advantageous for cutting uranium. Chips produced are oxidized, thus eliminating a fire hazard and simplifying disposal. Cutting with distilled water as the dielectric fluid was accomplished satisfactorily. The main disadvantage of distilled water is the decrease in resistivity that results from soluble compounds, which may eventually cause most of the electrical energy to be dissipated across the low resistance of the water instead of in the arc.

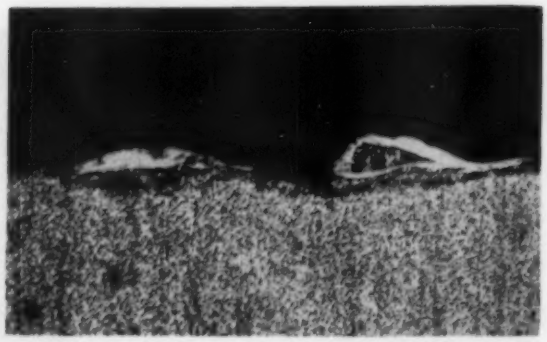
To determine the effects of electrical-discharge cutting on the specimens, condensers were connected across the electrodes to achieve high-energy arcs and cause maximum heating effect. This also resulted in rough finishes (see accompanying 100X photomicrographs). Much finer finishes can be obtained, and heating effects eliminated, by reducing or eliminating the condensers. Cutting time, however, is increased when this is done.

Specimens thus cut were cross-sectioned by conventional metallographic procedures at right angles with the surfaces produced by the electrical-discharge cuts, and studied by the laboratory's Metallurgical Division.

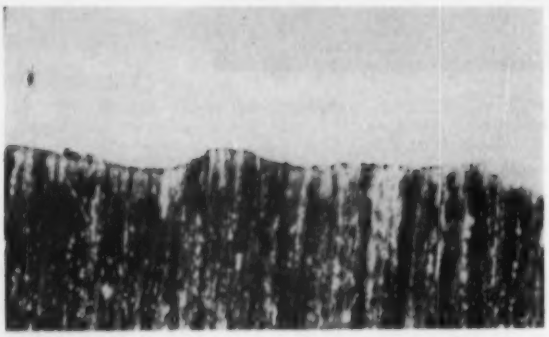
Only the uranium specimens showed any change from the heating effect of electrical-discharge cutting. Examination of photomicrographs of the two uranium specimens cut with 93-μf condensers connected across the electrodes shows a recrystallization of the surfaces to a depth of approx 0.010 in. But the uranium specimen cut without condensers in the electrical circuit showed practically no recrystallization.

Roughness of all specimens was obtained by scaling the 100X photomicrographs between the highest

Here are typical sawed sections enlarged about ten times



Specimen ..... Stentor Steel
Dielectric Liquid ..... Silicone Oil
Energy Storage Condensers ..... 93 uf
Time to Cut Off Specimen ..... 10 min.
Roughness—Peak to Valley ..... 0.0038 in.
Remarks: No apparent heating effects. High cutting rate resulted in relatively rough surface on face of specimen.



Specimen ..... 2S Aluminum Alloy
Dielectric Liquid ..... Silicone Oil
Energy Storage Condensers ..... 24 uf
Time to Cut Off Specimen ..... 3 min.
Roughness—Peak to Valley ..... 0.0016 in.
Remarks: No apparent heating effects.

Specimen ..... Normal Uranium
Dielectric Liquid ..... Silicone Oil
Energy Storage Condensers ..... 93 uf
Time to Cut Off Specimen ..... 18 min.
Roughness—Peak to Valley ..... 0.0023 in.
Remarks: A recrystallization from heating occurred to a depth of approx 0.010 in., as is noted easily in the photomicrograph.

peak and the deepest valley formed at the surfaces. Slower cutting would have resulted in much smoother surfaces.

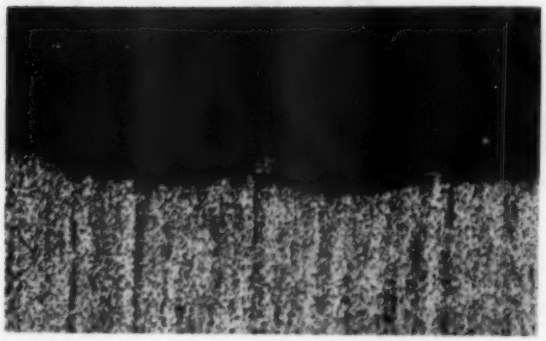
Because the first specimens cut were not radioactive, contamination problems did not develop. Therefore, to test contamination control when using the electrical-discharge cutting process, seven 3/16-in.-dia radioactive uranium fuel pins were cut in one of the high-level gamma caves, using the same machine with distilled water as the dielectric fluid.

An air sampler continuously monitored the air count in the cave. There was no material change in the background air count. Contamination inside the machine hood was 15 mr/hr at 2 in. hard and soft, using smear samples. Approx 4 in. above a 3-in. depth of the distilled water, the reading was approx. 2.5 r/hr.

Contamination of the machine is relatively low, and cave contamination is kept to a minimum. The contaminated dielectric fluid was disposed of by pumping off most of the water (after the uranium "chips" had settled) with a peristaltic pump. Remaining water and the uranium chips were fixed in the pan by mixing plaster of paris with the water and solidifying the mixture.

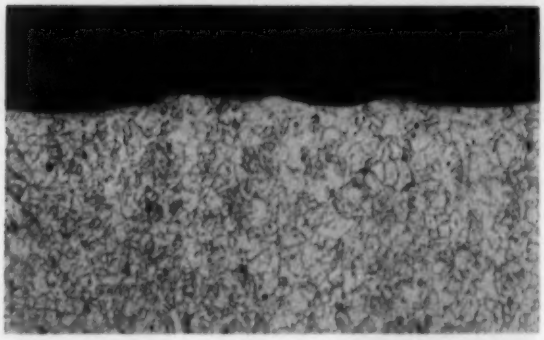
The electrical-discharge process appears to be a good method for performing many machining operations under remote control, inside laboratory caves, with good contamination control. Simple machines which are easy to decontaminate can be constructed to do slitting, cutoff, facing, and other operations.

The author acknowledges the assistance and contributions of members of the Remote Control Div staff, in particular L W Haaker who assisted in the design and testing of the machine, and the Metallurgy Div, in particular L T Lloyd who furnished the metallographic data for this report.



Specimen	Stentor Steel
Dielectric Liquid	Silicone Oil
Energy Storage Condensers	40 uf
Time to Cut Off Specimen	12 min.
Roughness—Peak to Valley	0.0025 in.

Remarks: No apparent heating effects. Roughness decreased by using less arc energy.

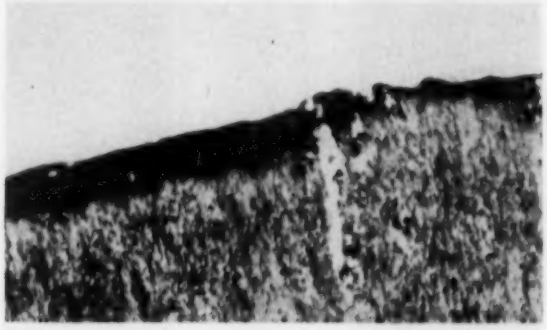


Specimen	Type 347 Stainless Steel
Dielectric Liquid	Silicone Oil
Energy Storage Condensers	93 uf
Time to Cut Off Specimen	13 min.
Roughness—Peak to Valley	0.0024 in.

Remarks: No apparent heating effects.

Specimen	Normal Uranium
Dielectric Liquid	Distilled Water
Energy Storage Condensers	93 uf
Time to Cut Off Specimen	27 min.
Roughness—Peak to Valley	0.0019

Remarks: A recrystallization from heating occurred to a depth of approx 0.010 in. Less heating effect would have occurred had arc energy and, therefore, speed of cutting been reduced.



Specimen	Normal Uranium
Dielectric Liquid	Distilled Water
Energy Storage Condensers	None
Time to Cut Off Specimen	Not obtained
Roughness—Peak to Valley	Very smooth

Remarks: Recrystallization from heating varied from zero, as shown above, to several thousandths of an inch in spots. This recrystallization probably was a result of the poor dielectric liquid during test.

Previous articles on Radioactive Materials

Hooded machines run toxic and radioactive jobs—S S Gold, *AM*—Feb 19 '51, cover & p133.

Radiocobalt reveals flaws in thick castings— R B Stanton, *AM*—June 11 '51, p137

Practical results from radioactive tracer studies of tool life, *AM*—Aug 18 '52, p108

How Oak Ridge machines beryllium—Case & Watkins, *AM*—Dec 22 '52, p93

Swedish tests prove out radioactive tool experiments—*AM*—Mar 16 '53, p194

Robot-run tools machine hot materials at Oak Ridge—Steward E Dismuke, *AM*—Apr 12 '54, p161

Beryllium—extruding, rolling *AM*—Mar 15 '54, p182

To machine radioactive materials—S L Lindbeck, *AM*—Apr 12 '54, p166

Beryllium—techniques for development—Lowenstein, Kaufman, Arnold & Bishop, *AM*—Apr 12 '54, p203

Beryllium—rolling and forging—Shields M Bishop, *AM*—Apr 12 '54, p207

Pure metals direct from raw ores—*AM*—June 7 '54, p174

Geiger counter solves leak problem—*AM*—Jan 3 '55, p141

How to machine uranium—Alexander Densi; *AM*—Aug 1 '55, cover & p95

Underwater miller machines nuclear fuel—S L Lindbeck, *AM*—Aug 15 '55, p110

Beryllium, Uranium, Zirconium—how to work, *AM*—Mid-Nov, p116-119, 128

Previous articles on Electrical Discharge

Soviets Claim 'Electroerosion' Revolutionizes Metal Cutting—Robert Magidoff. *AM*—May 8 '47, p162.

Machining by Erosion—B R and N I Lazarenko (Soviet Electrical Institute, USSR). *AM*—Dec 18 '47, p120.

Arc Machining Makes Hard-to-Cut Jobs Easy—H V Harding and V E Matulaitis. *AM*—Mar 3 '52, p136.

Electrical-Discharge Machining—H V Harding, V E Matulaitis and R C Stake. *AM*—Mar 15 54, p137.

Carbide Cuts Carbide Chipbreakers—Anderson Ashburn. *AM*—Apr 12 '54, p185.

Four-Station Machining by Electrical Discharge—The Cincinnati Milling Machine Co. *AM*—Aug 16 '54, p170

Insulated Drill. *AM*—May 9 '55, p177.

Special Shapes. *AM*—June 6 '55, p148.

Electrical-Discharge Diesinker . . . a New Shop Tool—George L Weiser. *AM*—Oct 10 '55, p148.

Electrical-Discharge Unit Reforces Dies. *AM*—Jan 30 '56, p83.

How to Understand Spark Erosion—William M. Stocker and R Decat. *AM*—Apr 23 '56, p113.

Electrical-discharge Setup Pays Off in One Month—*AM*—Oct 22 '56, p127.

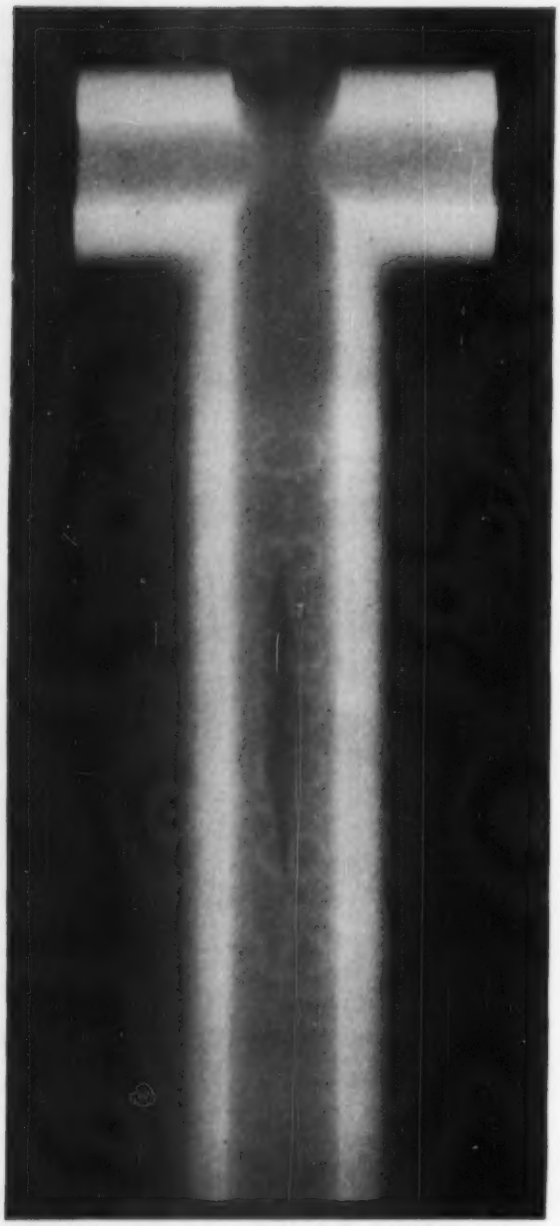
Spark Erosion Behind the Iron Curtain—*AM*—July 30 '56, p90.

Drilling Burrless Holes (Shop Shot)—*AM*—July 16 '56, p123.

Electrical-Discharge Machining Service Offered (Spot News)—*AM*—Jan 17 '55, p85.

Also sections in 1955 & 1956 *AM* Planbooks (Mid-Nov.)

Radiographic ... Avoid



Voids, such as pipe, are revealed by dark areas. Defects of this kind can occur in steel, magnesium and aluminum castings. Most photographic prints of X-ray negatives do not have enough contrast for easy reading. Usually, the negative is checked with a light box

J M THOMPSON, JR.,
research metallurgist,
CONVAIR-FORT WORTH,
DIVISION OF
GENERAL DYNAMICS CORP

Because of the accelerated production schedules often encountered in aircraft manufacture, ordinary procurement procedures are frequently by-passed. The vendor is told to ship aircraft castings as expeditiously as possible, to be put into work as soon as they arrive. If X-rays reveal excessive defects or if the static design-load requirement is not met, then the in-process labor, shipping and X-ray costs are lost. Additional time is required to obtain replacement castings.

For this reason, Convair-Fort Worth has established an engineering specification that states that the foundry-control casting, usually the first casting poured in any alloy of any configuration, must be approved by our Process Control Department.

X-rays of this casting are examined for film quality, density and general technique. Cold shuts, porosity, excessive shrinkage, etc, are noted, and the producer is notified immediately. He then corrects these conditions and resubmits a new set of foundry-control X-rays. If these prove satisfactory, he pours a small production lot. This lot is X-rayed and the two least acceptable castings are selected by the manufacturer or by an independent X-ray laboratory and designated as test castings No. 1 and No. 2.

Five copies of the X-rays for each view of the two least-acceptable castings are made and are designated as standards. The Process Control Department reviews these films and with the aid of stress diagrams evaluates and verifies the selection of the test castings and also judges the quality of the X-rays to be used as standards.

Test casting No. 1 is then statically tested and a sketch is made showing stressed areas, the point of failure, the load at failure and the ratio of load failure to design load. This information is kept with a copy of the standard film to assist the Receiving Inspection X-ray reviewers in their evaluation of production castings. Castings that have defects in critical areas that exceed those shown on the standard film are rejected. Defects in non-critical areas are rated numerically and disposition is based on the structural function of the part.

A manual that classifies castings; classifies defects in castings; explains the numerical rating system, and defines and illustrates the various types of defects has been prepared for use by the Engineering, Purchasing and Quality Control Departments and by vendors concerned with the casting program.

The manual states that all castings must be classified on the engineering drawing thus:

Class 1—Single failure would case loss of aircraft; loss of control; unintentional release of or inability

Standards . . .

Machining of Bad Castings

Twelve types of defects, four of them cause for outright rejection, can occur in castings. Reference films aid Quality Control in establishing standards for castings at the time of foundry-process development and to assure rejection of production castings not up to specifications

to release armament store; failure of gun-installation component, or cause significant injury to crew.

Class 1A—A single failure would cause loss of aircraft.

Class 1B—Class 1 castings not in Class 1A.

Class 2—All structural castings not classified as Class 1.

Class 2A—Calculated margin of safety (200% or less).

Class 2B—Calculated margin of safety over 200%.

Although not required by Government Specification MIL-C-6021B, Convair specifies that structural-strength requirements and radiographic standards be established by static test for Class 1B castings that have calculated margins of safety less than 200%. In addition, all castings must have a minimum margin of safety of 33 1/3%.

Elsewhere the manual states that in the examination of the radiographs there are two major types of defects to consider. Type A defects—cracks, shrinkage cavities, cold shuts and misruns—generally cause localized-stress concentration and are cause for rejection of the castings, unless subsequent machining will entirely remove the discontinuity.

Type B defects such as porosity, dross, gas holes, microshrinkage, inclusion, segregation and mottling do not generally cause critical stress concentration but must be evaluated when present.

Upon reviewing radiographs, an X-ray report is made. This report covers the Type A and Type B defects and the quality of the radiographs.

When the film is reviewed, Type B defects are classified by a numerical rating. These defects are not normally serious and receive the following ratings: (1) small, (2) moderate, (3) large and (4) excessive (reject). The basis upon which the Type B defects are rated will depend upon the amount of reduction in cross-sectional area they effect and the size and location of the defect. These defects are normally noted for critical areas only. Defects in foundry control and test castings are rated on the basis of experience and general engineering information. Defects in production castings are rated on the basis of established radiographic standards.

Definitions of Type A defects: *Cracks* appear as dark lines, either straight or ragged. These may start at the surface or internally and have no definite line of continuity.

Shrinkage cavities appear as jagged darkened areas on radiographic examination. They are voids left in cast metals as a result of solidification. Shrinkage occurs during the progressive freezing of metal.

Cold shuts appear as definite darkened lines in bands of variable length with definite smooth outline. A cold shut is a discontinuity that appears on the surface cast metal as a result of two streams of liquid melt failing to unite.

Definitions of Type B defects:

Porosity is: (a) Shrinkage porosity is spongelike and appears as a localized lacy or honeycombed dark area on radiographic examination, or (b) Gas porosity appears as round or slightly elongated dark spots corresponding to minute voids throughout the casting.

Dross, or metallic-oxide inclusions, appear as small dark regions having an irregular or indistinct outline, and will vary in intensity. They can occur at random in or on the casting.

Gas holes (blow holes) appear as round and/or elongated dark spots having smooth edges with definite outlines and occur individually or in clusters throughout the casting.

Microshrinkage appears chiefly in magnesium-alloy castings as dark feathery streaks or irregular dark patches and is caused by shrinkage in the grain boundaries.

Inclusions appear as darkened spots of uneven granular texture with indistinct outlines.

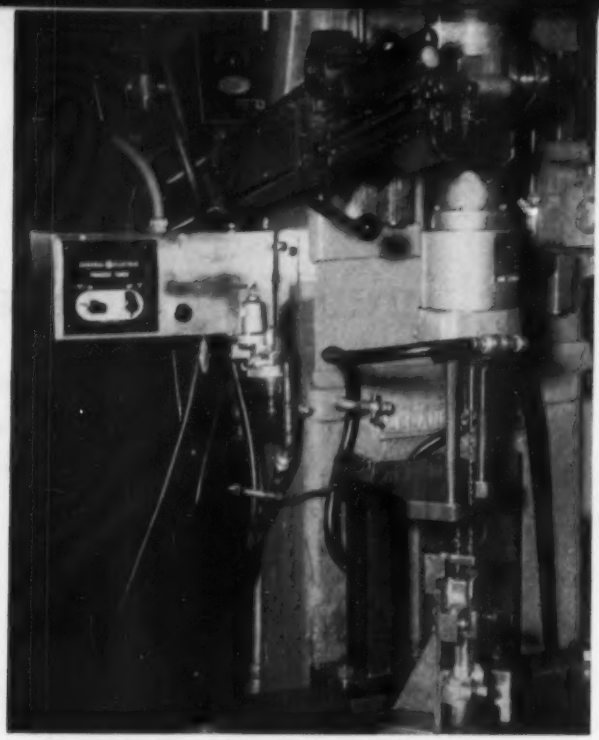
Segregation appears as well-defined white spots, with irregular shapes. It is formed as a result of the primary crystallization of one phase, with subsequent concentration of other elements in the remaining liquid.

Mottling appears as poorly defined alternate light and dark areas (not to be confused with poor surface condition). It is a type of segregation and is caused by the same factors.

Misruns appear as large definite darkened areas of variable size and with smooth outline. Misruns result when the cast metal is poured too cold and it solidifies before filling the mold completely.

Actual radiographs demonstrating the above defects were obtained from castings inspected by the Process Control Laboratory. These are indexed and marked for easy reference.

Cut time 75%...
Minimize scrap...
Free operator...
Maintain straightness...
Keep setup versatile, when...



AUTOMATIC OPERATION of conventional drill press is achieved by adding a Sensitorque and a process timer. Important advantage is that holes having a depth-to-diameter ratio of 90:1 are drilled straight within 0.005 in. in less than 2½ min. Simply resetting controls makes it possible to work other materials or different diameters within a few minutes. Drills in this setup turn at 1800 rpm

Conventional components

JOHN T BROWN, methods engineer, Methods Engineering Department, TAYLOR INSTRUMENT COMPANIES, ROCHESTER, NY

Ten years ago drilling two holes in this Taylor manifold took 15 min.; today we are completing the holes in 2.2 min. And today's scrap rate is negligible compared with the losses of yesterday. The two holes are 3/16 in. dia; one hole is 5¼ in. deep and the other hole is 5⅝ in. deep. A bronze casting is used to make the part. Only a 3/32 in. wall separates the drilled holes from the exterior of the part.

Because of the depth of the holes, we had a serious problem maintaining straightness. Either the operator fed the drill too fast and the drill wandered or he fed it too gently and production suffered. Also, it was difficult to determine the most practical time to sharpen the drill, as this too would affect straightness and cutting time.

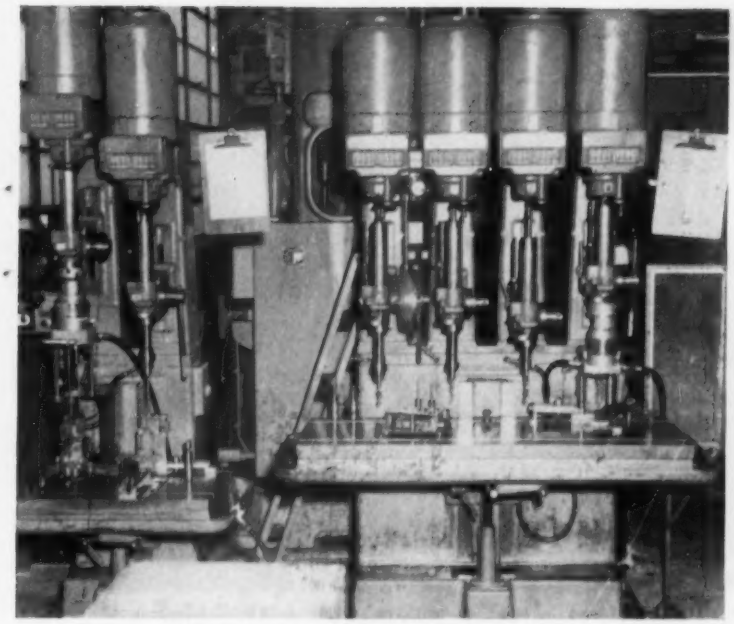
With these problems in mind, we decided to retool the job to eliminate the manual variables. However, while we run these parts on a regular basis, the production operations do not occur continuously; hence we could not afford to invest in an expensive permanent setup. We needed something low cost and flexible. The most practical solution seemed to call for making the present setup automatic.

For both holes we use a double-margin drill, similar to a crankshaft drill, having a conventional point for bronze and made of HSS. Also, both holes are drilled simultaneously, with the manifold firmly held in a drill jig. Drills are driven through a Zagar drillhead.

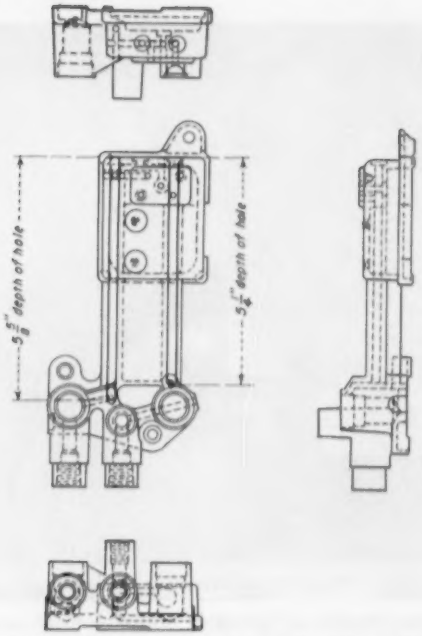
Because torque seemed to be the controlling element in cutting, we started the new setup by adding a Bellows Sensitorque to the drillpress. This device measures the torque on the drill and maintains a predetermined torque by controlling the drill feed. It is attached to the spindle feed pinion on the side opposite the handle. After a number of trials, we found the torque that gave us the best hole.

Using the Sensitorque solved the feed problem. However, another condition developed as a result. Cutting ability decreases with tool wear but torque increases. Thus the Sensitorque did its job well; it maintained constant torque until the hole was completed, regardless of the condition of the drill—even if the operation took 15 minutes.

One solution to the new variable might have been to replace the drills at predetermined intervals, perhaps after every 15 or 25 holes. However, bronze castings do not allow very satisfactory predictions of tool wear, and the drills seldom either cut or wear at the same rate. Systematic drill replacement could prove wasteful in either of two directions. If



ENTIRE DRILLING OPERATION is completed on these two machines (6 spindles) by one operator. While deep holes are drilled automatically, other parts are manually drilled at adjacent positions. Floor-to-floor time is 6½ min. Operations include drill, spotface, counterbore, countersink, and inspection



MANIFOLD is made from bronze casting and includes a number of holes in close proximity. It is also important that no burrs or chips be left in air passages. Double-margin, crankshaft-design drill is used for deep holes

automatize standard drillpress

changed too soon we would waste drills and sharpening time. Drills that were not replaced soon enough could cost us operation time and could cause scrap.

A more practical answer was to connect a General Electric Process Timer into the setup. This was suggested by the operator. New drills complete the holes in less than two minutes. We set the process timer for two and one-half minutes. If the holes are not completed in that time limit, a lamp on the timer is lighted to indicate that the drill is dull or some other trouble is interfering with the operation. We *average* 50 holes per drill sharpening—but at times individual drills vary. In any case, we get the best useful life out of each sharpening. And, by the way, this combination of torque and time will quickly show you the advantage of machine sharpening over hand methods.

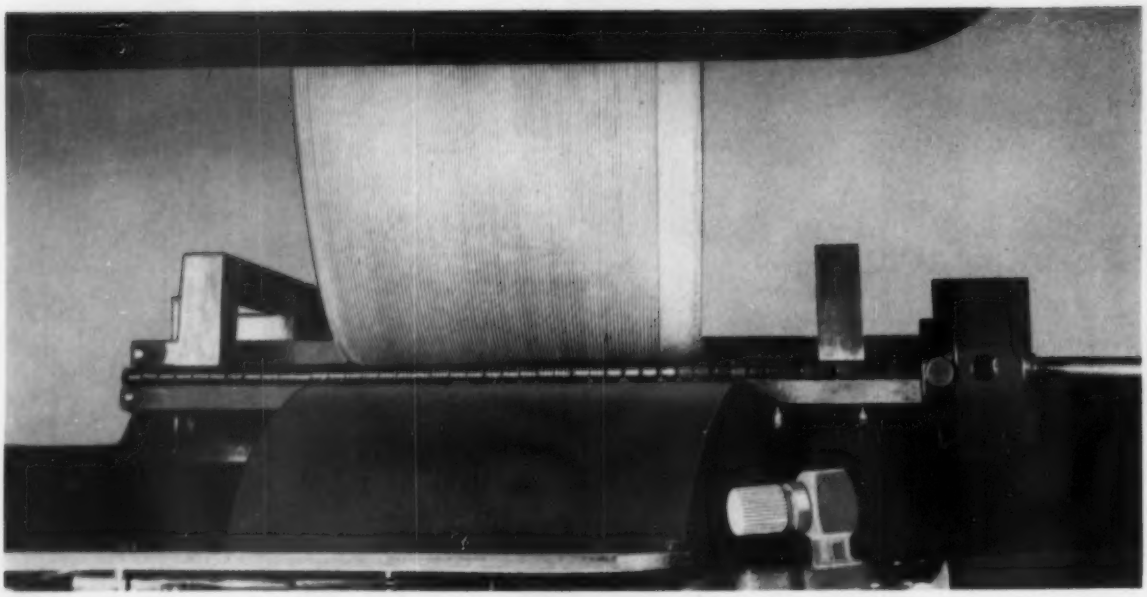
Only one phase of the operation was still being done by hand—cutting oil was brushed on and chips were blown off. The men in the shop added a Skinner valve to the Sensitorque which blows air only while the drill is operating. This provides cooling and blows off the chips.

Formerly two, and sometimes three, operators were needed to complete the drilling operations on this manifold. Now the complete job is done by one operator handling two machines comprising a total of six spindles.

While the deep holes are being drilled automatically, all of the other drilling operations can be done on the adjacent spindles. For the deep-hole operation the operator need only place the casting in the jig and turn on the timer. When the operation is complete the spindle will return to starting position and the machine will shut off.

Drills used for the other operations on the manifold are still manually fed. However, our success on the deep holes is giving us ideas. One thing is certain, this combination of torque control and process timing, applied to a machining operation, has given us a valuable new experience in simplified automatic manufacturing.

Instrument components, like many other mechanical parts, are rarely manufactured in such large quantities that special machines are justified. Nevertheless, there can be important quality and cost benefits in automatic operation that includes flexibility. The combination of controls in this setup has shown us a way to achieve automaticity and versatility; one answer to automating the "job shop," and maintaining the accuracy we need.



Centerless-thread grinding hollow-head setscrews, ranging from No. 4 to 9/16-in. dia, is performed automatically and by the through-feed method. Thread form on the grinding and regulating wheels is produced by a semi-automatic, hydraulically operated wheel-crushing device. The crusher roll is reground on the machine by its own mechanism, thereby minimizing need for crusher-roll replacement. Average time for redressing the wheel is 8 hr; however, on smaller-size threads wheels have run 40 hr before redressing. Any desired wheel contour is achieved by utilizing a diamond and interchangeable profile cams coupled with the adjustable traversing speeds of the dressing units. Note that the grinding wheel is dressed to serve two purposes, one to provide a plain grinding face on the entry side for establishing the correct workpiece OD, and progressive formation of threads

Have you considered generating threads by centerless grinding?

Today, generating threads by the centerless grinding process offers challenging production advantages. Class 3, 4, and 5 threads can be produced at high production rates by the through-feed and infeed methods, at low cost, operating at 100% efficiency. Threads, worms, and hardened plug gages are being produced from solid blanks in one pass. Here are data on typical production setups, including costs

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LANDIS MACHINE CO, WAYNESBORO, PA

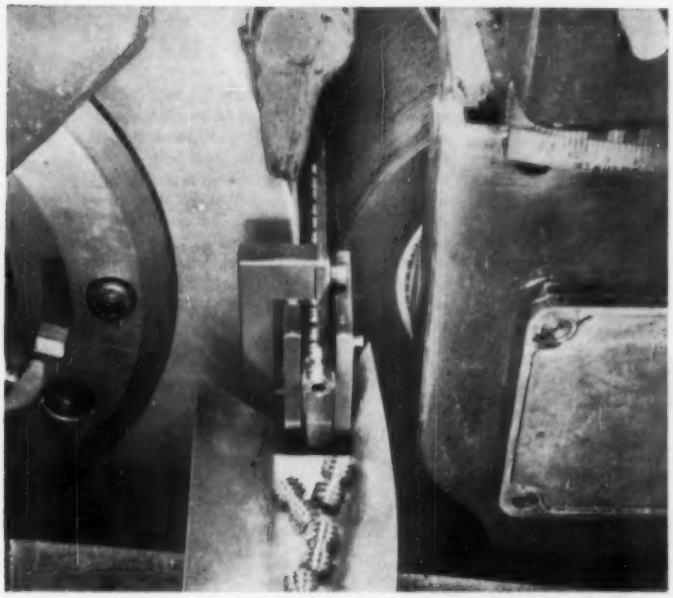
Centerless thread grinding was originated more than twenty years ago, but not until recently has this process been developed to a point at which it could be relied upon for production purposes. Initially, the process was hampered by lack of suitable grinding wheels. Now, after years of intensive research, grinding wheels capable of being crush formed have been developed.

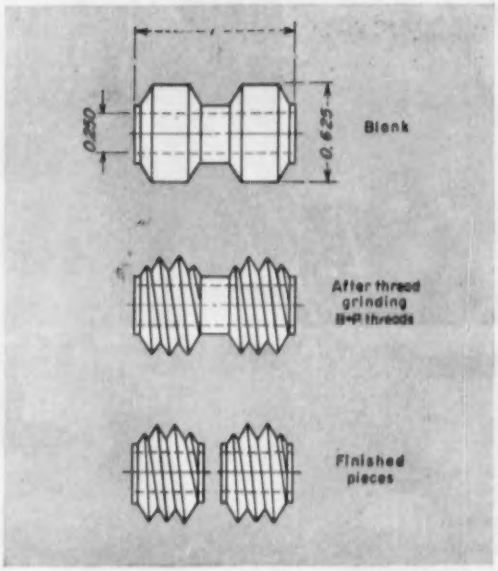
METHODS OF GENERATING THREAD

There are two basic methods of centerless grinding screw threads. They are the through-feed and the infeed methods, comparable to those used for cylindrical centerless grinding. On some thread-grinding jobs, a combination of infeed and through-feed methods can be used.

THROUGH-FEED METHOD

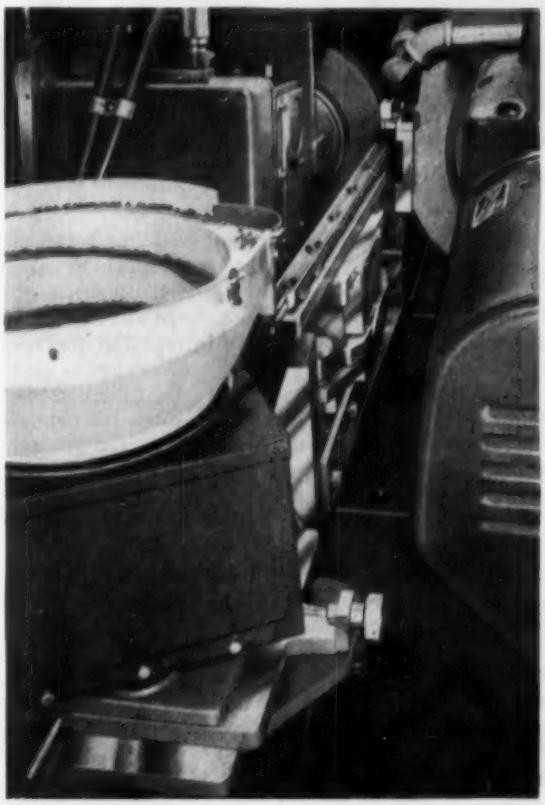
The through-feed method is used for work requiring threads on the largest diameter and having no interfering shoulders to prevent passage of the work between the grinding and regulating wheels. By this method, the work enters the machine at one side of the wheels, passes axially between them, and emerges at the opposite side. Generally, threads right or left hand, are ground from the solid and completed in a single pass. Production rates are high, as most setups are fully automatic, and hopper fed. Typical production jobs based on 100% efficiency, include No. 6 class 3 setscrews, 3/16 in. long, 32 P—





Single-pass through-feed setup produces 14 stainless-steel 8 P worms per min from seven double blanks as shown in sketches. Specifications called for a lead error of less than 0.001 in. in one inch, pitch diameter to be concentric with the bore within 0.001 in. TIR, and a tolerance of ± 0.005 in. on the pitch diameter. Double blanks were used to insure solid support on the workrest blade as well as the concentricity tolerance during the grinding cycle. Worms can be ground by this process, providing the helix angle is 5° or less

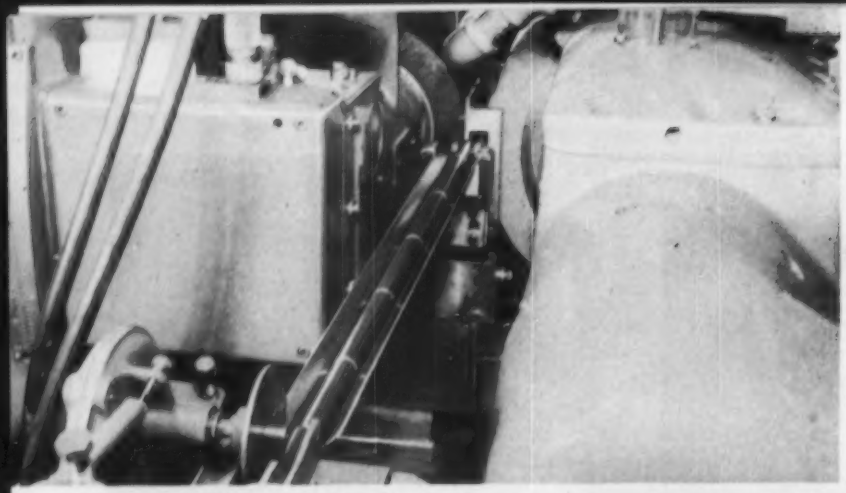
7500 setscrews per hr (¼x¼, 20 P, class 3) are centerless thread ground automatically in this setup. A vibrating hopper delivers the screw blanks into a vibratory feeding tube from which they are fed in a continuous stream to the workholding blade. Total cost for producing 10,000 of these setscrews ran $0.46. Largest item included in this cost was the grinding-wheel cost of $0.21, and while not the smallest, crusher-roll cost was $0.06



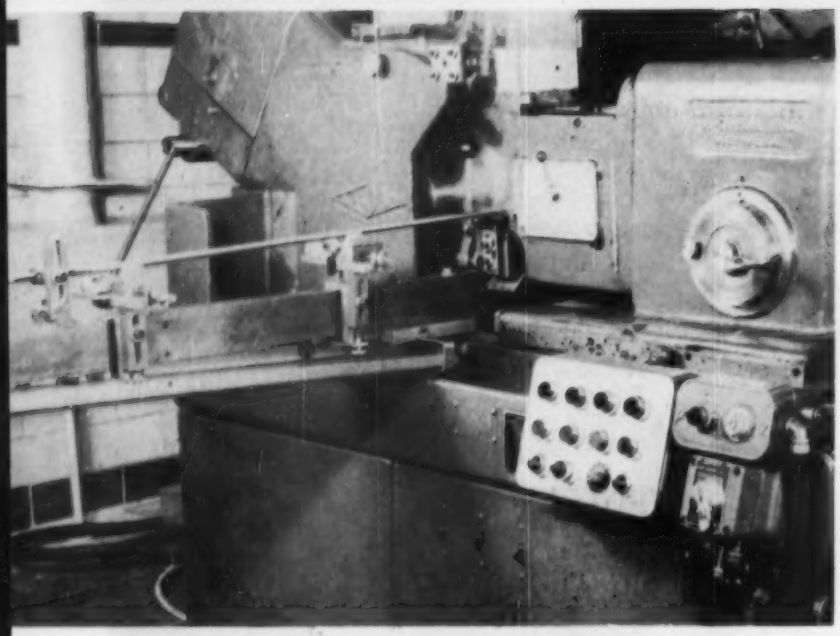
9100 per hr, No. 8 setscrews, 3/16 in. long, 32 P—8400 per hr, No. 10 setscrews, 3/16 in. long, 24 P—10,000 per hr, and ⅜x⅜-in., 16 P setscrews—4500 per hr. High-tensile, continuously threaded ⅝-in.-dia, 11 P studs are ground at 1030 linear in. per hr from hot-rolled bar stock, not previously machined. Studs, 1 in. in dia, 8 P, are produced at 485 linear in. per hr, while 1½-in.-dia, 8 P studs are ground at 335 linear in. per hr. A complete machine change from one size to another, including pitch changeover, can be accomplished in one hour by an experienced setup man.

INFEED METHOD

Essentially, the infeed method of centerless thread grinding is used for parts having one or more diameters larger than the diameter to be threaded and for parts requiring threads concentric, within close limits, to another part diameter. Threads can be ground either right or left hand and from the solid or from precut threads. Approximately three revolutions of the work are required to finish the thread, with the relief or imperfect thread at the shoulder limited to one pitch. Production rates are higher



Stud blanks ranging from ½- to 2-in. dia are centerless thread ground to ASA standard class tolerance from 4140 steel Brinell 260 to 230. Continuous threading is accomplished by feeding the workpieces into the machine from an automatic floor hopper. Wheel crushings are necessary every 8 hr, and from 0.010 to 0.015 in. need be removed from the grinding-wheel face to restore proper thread form. Size control is accomplished from a large micrometer dial graduated in 0.0001 in.



Titanium-alloy steel studs, 48 in. long, annealed condition, are ground by the infeed method using a special workholding fixture equipped with socket ball rollers for ease of work rotation. Threads, 20 P, 1⅛ in. long, are ground to class 3 tolerance in 1½ min, floor-to-floor time, for threads on both ends of stud. Concentricity between body diameter and threads is held to close tolerances without difficulty because the work is rotated and supported by the body diameter. A roller supports the stud next to the grinding wheel and simultaneously holds it against the regulating wheel to permit proper driving action

than can be obtained by thread grinding between centers, but lower than those obtained by the through-feed method. Grinding-wheel life between dressings is usually limited to a range of 100 to 200 threads, hence more downtime is required for recrushing.

Examples of production by the infeed method are double-end studs having different pitch diameters. On this job, 100 ¾-in.-dia studs are thread ground on one end, the machine is readjusted for size, and the opposite end finished in a floor-to-floor time of 150 sec. One crush-dressing produces 200 threads.

Higher class (4 and 5) threads require precise machine adjustments and operating at lower grinding speeds. An interesting case study of such a setup is one in which thread plug gages are produced by the centerless infeed process to prepare the plugs for final lapping. Production is considerably increased and rejections before lapping similarly reduced. Lead errors on ⅜-in.-dia 16 P plugs range from 125 to 250 millionths, measured over 1¾ inches. Average accumulated lead error in 1 in. is 105 millionths.

OPERATING COSTS

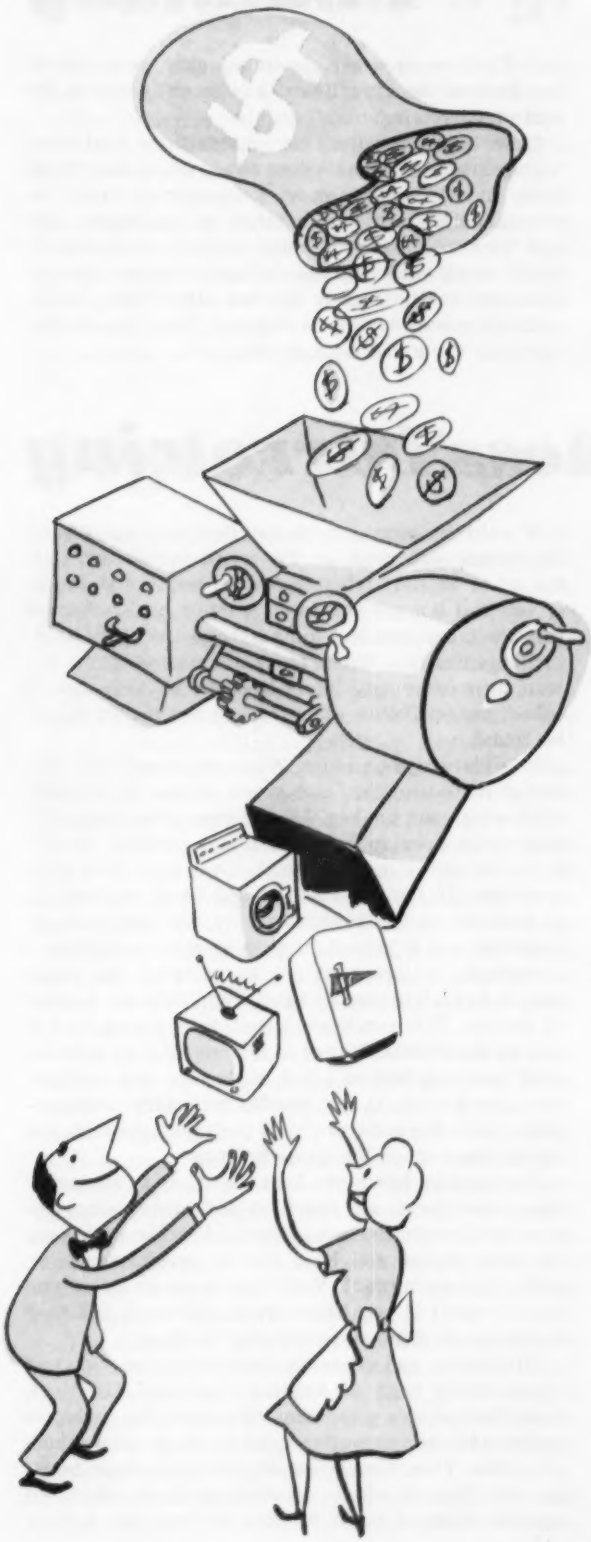
Operating costs for a centerless thread grinder are relatively low. Costs for grinding high-tensile continuously threaded studs for a period of 397 hr, wherein 331,684 linear in. of ¾-10 threads were produced, showed a charge of $0.443 per 1000 linear in. Production rate averaged 835 linear in. per hr including recrushing time. During the 397 hr of operation, the grinding wheel was reduced from 20 to 17 in. in diameter. Maximum run for one recrushing was 16 hr, minimum 12 hr, or an average of 14 hr per dressing. An itemized breakdown of the total cost for 1000 linear in. showed the following charges:

Grinding wheel	$0.242
Regulating wheel	0.025
Work-rest blade	0.131
Crusher roll	0.022
Diamond	0.023

It is interesting to note that the grinding wheel represents the largest cost, the crusher roll the least.

American Machinist
SPECIAL REPORT NUMBER 434

INDUSTRIAL FINANCING:



How to find MONEY for your business

WILLIAM M STOCKER, JR
ROBERT N SHEETS
associate editors

Money is as important an ingredient of manufactured products as manufacturing methods and materials. When dollars are limited, growth is limited. Just as new methods must be found to meet modern technological needs, and just as the supply of some materials becomes critical when demand is high, today new money must be found to meet the requirements of industrial growth in a time when the supply is tight. Where are these funds available?

Before you can look for them with any seriousness you must know how they will be used, for what period of time the money is needed, and the price you can afford to pay for the use of the money.

Knowing these things you next must decide, at least tentatively, whether you will borrow the funds or acquire them as a capital investment by sharing your business with others. This preliminary decision may change as you get further into the problem.

Typical financing includes: mortgages, term loans, short-term loans, chattel mortgages, conditional bill of sale, factoring, sale of stock, bonds, loans against accounts receivable, loans against inventory, and leasing. Funds are available from banks, brokers, industrial finance houses, factors, private investors, loan agencies, government, and some relatives. Which of these funds and sources will best suit your need? Which of them does your financial and business health entitle you to use?

This report will give you a quick picture of current industrial financing, plus sources, descriptions, attitudes, requirements, and pitfalls in finding money.

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$ for your business . . .

• Financing

As Metalworking faces a period when money is the tightest in twenty years, and when capital reserves are thin as consumer demand and industrial growth are on the upswing, it is important to know where dollars are found and the cost of obtaining them.

What causes tight money? The main trouble is that there just are not enough workmen and materials to go around to build all of the projects businessmen think up in our present growth economy. Thus businessmen bid higher and higher for the materials and services that are available—and borrow more and more. Demand for capital exceeds the supply of capital. To prevent a serious inflationary price spiral, the Federal Reserve Board has recently raised the cost of borrowing.

Now banks must either charge their customers higher interest or themselves cut down on borrowing from the Federal Reserve. Businessmen must re-evaluate their projects in terms of the higher cost and lenders must look more closely at ability to repay loans and charges. Industry makes heavier demands on the money sources other than banks and this money supply is reduced. Thus the market tightens; the pinch is on credit.

• Business borrowing

First and most important of your business activities is affiliation with a local commercial bank. In the United States, throughout most of business history, the commercial bank has been one of the major sources of loanable funds. Equally important, your bank is the first place a potential lender will go to check your credit. With total assets of nearly $200 billion, the more than 13,000 commercial banks in the nation are the largest source of short-term business loans.

Note that the emphasis in bank loans, however, is on *short-term* loans. The reason is simple. Banks must keep their funds liquid. Because commercial banks accept, as deposits, the funds of business enterprises and individuals, and because these are demand deposits (entitling the depositors to withdraw them at any time) the bank cannot afford to tie up the funds in long-term loans.

You are saying, "Well, how come so many real estate mortgages and long-term loans are handled by banks?" Commercial banks can place some of their funds in this way, however savings banks place a much larger proportion of their funds in real estate mortgages, etc, because savings depositors do not require the same degree of fluidity as in day-to-day business operations. Practically all commercial banks will grant mortgages to some degree but many of them do not use their own funds. They sell the "paper," at a discount or commission, to other lending organizations. Sometimes they "service" the loan, collect interest and so forth, for the lender and receive a fee for this service.

In times of tight money, such as the current situation, the commercial bank is among the first to feel the pinch, particularly if it is a member of the Federal Reserve System. When the demand for money is high and the cost of borrowing from the Federal Reserve is increased, these banks cannot afford to freeze their funds in long-term loans.

Whether or not the bank you deal with can supply the money you need, or the terms you'd like, it is the place to start when you need additional funds. If you can borrow the funds from a bank, chances are it will cost you less to do so than any other lending organization. When the bank cannot grant the loan, it is extremely likely that the bankers can, if asked, suggest other places where the money might be found.

It is just common sense. When you want steel you ask a steel supplier, and when money is needed, start with your banker. Just as your other suppliers frequently provide many customer services, so the bank has many methods for helping you solve your problems. If you are a sound and loyal customer it is as much to the banker's interest to keep you in business as it is important to your other suppliers.

Attitude is important too. From habit, too many people feel frightened or awed when they are dealing in money. This condition is not only wrong, but it can be dangerous. Money is an essential to running your business, just as labor, materials, and machinery are essentials, so handle monetary arrangements with the same practical business approach you use in your other business dealings.

One caution however: In banking, as in engineering, some things are standard and other things are special. If you'd discuss a special bearing with your engineer before you buy, discuss special financing with your accountant. You'll get more attention and more respect if you know what you want and how to discuss it when you visit your banker.

Ultimately, and generally, bankers can provide just about every type of funding available. However, conditions at any given time determine the extent to which a banker will offer these funds, or make them available. Thus companies, or private banking houses, are formed which concentrate their effort on specific kinds of loans. Typical of these are factors,

tomorrow's growth...

When this happens, small businessmen feel it more than big firms. The reason: when banks can't accommodate everybody who wants money, they naturally take care of their best customers (the top credit risks) first and let the others look elsewhere.

However, in spite of the higher cost of borrowing, businessmen are showing no signs of abandoning vast expansion programs. It looks now as if only greater output and higher productivity will halt the spiral. And much still remains to be done about increasing the money supply without creating a devastating inflationary spiral.

Today the stigma of borrowing is gone. The reason is simple: few firms can avoid it. Also, both borrowers and lenders recognize that it is a business transaction in which the borrower is paying an agreed fee, "rent" if you like, for the use of the money. Loans are rarely given as a favor begged. Provided only that the borrower can show an acceptable ability to repay the loan, or is willing to compensate the lender for the risk involved, there is no reason why he should hesitate to ask for money.

If you need funds, call the lender you select and make a date to meet. He'll be glad to see you.

begins at banks...

commercial paper houses, industrial finance companies, investment bankers, and personal finance companies.

In the language of finance, there are two distinct kinds of borrowing: One is the "money market" where one goes to seek short-term loans. The other is the "capital market," which supplies long-term loans. Today, it is not unusual for the two to be intertwined or for a single lending organization to provide both kinds of loans. Nevertheless, the distinction exists. Usually, loans are made in the money market for day-to-day operating expenses such as payroll, inventory, taxes, and other immediate needs of short duration. Capital loans are made for buildings and items of capital equipment such as machine tools, power generators, and office furniture. In between current operating needs and major capital loans, bridging the two, are a whole series of intermediate loans, made in the capital market, to meet the intermediate debts of business firms.

The tight-money market referred to so often actually is a tight capital market. Short-term loans, while somewhat more expensive now, are less difficult to obtain. The really tight money is in long-term loans for capital equipment and expansion.

"Term loans" are loans for periods longer than one year. "Short-term loans" are granted for periods less than one year and, usually, for 30, 60, 90, or 120 days. The average maturity of a term loan is 5 to 10 years. Fewer than 10% of all of the term loans now outstanding exceed 10 years.

The answer of a number of commercial bankers to availability of term loans seems to be, "As long as the Federal Reserve continues this tight money it is the policy of our bank not to grant *any* term loans except in very special circumstances. We simply have no funds available for them."

This, of course, refers only to banks, and individual banks may not have shut off the supply. The industrial finance houses and factors most active in the field say that they have loans available with maturities up to ten years. However, even these organizations prefer a maximum maturity of two to three years and practically all of their loans are amortized. Also, these loans are more expensive than bank loans.

An ancient maxim of the banking business is that any business loan must be made against collateral or against a financial statement. In other words, while there are surely exceptions, something must be shown to guarantee repayment of any business loan.

Which bank do you want?

In selecting a bank, a business firm must consider the size of the bank, the services available, location, and other facilities and conveniences. In addition it is important to know loan policies, loan limits, the size and nature of the bank's assets and liabilities, and various credit ratios.

Don't hesitate to ask this information of any bank you are considering. Most reputable banks will give the details willingly and proudly. A few old-fashioned bankers still say, "You're asking me for a loan and you have the nerve to ask *me* to establish *my* reliability and financial responsibility?" This attitude, however, is rapidly dying. You are entitled to know what to expect and to what extent you can depend on the bank's services, just as you check the reliability of any other supplier. The modern bank hopes to establish a permanent relationship with you as a customer.

When you place funds with a commercial bank, they may take the form of time or demand deposits. One type of demand deposit is the checking account; another form is the savings account, with funds held indefinitely. (However, in many states corporate

funds cannot be taken into savings accounts.) Some funds are also placed as "time deposits" to meet upcoming income-tax payments or some other expenditure for which a "liability reserve" is created. The latter might also be a "sinking fund" to pay off a mortgage at some future date.

Whether or not you need money now, it is smart to establish this fiscal relationship with your local bank. And, as is more likely, if you are banking locally visit the bank's business-loan department. Meet the manager. Discuss loan policies and availability. A good commercial bank should provide these services:

- Collect checks and other credit instruments for customers.
- Pay checks drawn upon the bank; clearinghouse associations, etc.
- Supply currency for till-money needs.
- Supply cashier's checks, drafts on foreign and domestic correspondent banks, traveller's checks, letters of credit, safekeeping facilities, etc.
- Provide trust and agency services.
- Give credit information.
- Advise on financial problems.
- Offer services for sale and exchange of securities.
- Night depository.
- Payroll preparation service.
- Business loans.

How big a bank?

At the outset it is wise to learn whether the bank is keyed to the size of your business. Perhaps you won't care to be the smallest customer in the bank. More important, what does the bank require as a minimum balance for business concerns? If it is $20,000, you might do better elsewhere, depending upon the size of your business.

Conversely, if you can manage it, many people recommend using more than one bank. Thus, if you need help, you will be the customer of two or more banks and will have a better chance of getting a loan than if you depend only on one bank. Also, when large sums are involved, perhaps beyond the legal limit of one bank, the loan can be shared.

Nevertheless, the size of your business will determine whether you need two banks. Most companies should use one bank; are one-bank customers and are best served by establishing a close relationship with a single, efficient banking service.

(No national bank is legally entitled to make an unsecured loan to one borrower in excess of 10% of the bank's capital and unimpaired surplus. Many state banks are covered by similar rulings, with a variety of limitations throughout the forty-eight. New York State, for example, permits loans up to 10% of capital, surplus and undivided profits.)

For business purposes, in selecting a bank you may consider the services connected with deposits ahead of those relating to loans. Since the 1930's many businessmen make a special effort to insure dealing with a sound bank. Very few banks will feel that you are presumptuous or unrealistic to ask for financial information beyond that in its published financial statement.

While it does not hold that only member banks are sound, or that no member bank can fail, you have a better guarantee of health when you select a bank which is a member of the Federal Reserve System. Members of the Federal Reserve pay all checks at par, which does not hold true for all non-member banks. Also, there is a safety factor in selecting a bank that is insured—that participates in the Federal Deposit Insurance Corp. Thus your deposit is insured up to $10,000.

If you are responsible for banking sums larger than $10,000, you should analyze the assets and earnings of the bank prior to depositing the funds therein. In rating banks, you may check the ratios of your bank against those found in the annual reports of the Federal Deposit Insurance Corp. A variety of ratios are available for the different types of banks in the country. The Comptroller of the Currency also publishes statistics which are useful in computing ratios for national banks.

Some of the ratios used to check banks' financial positions are: (1) The "quick assets" ratio (cash and short-term government securities, less government bonds, as a percentage of deposits or assets); (2) the earnings ratio expressed as a percentage of total capital accounts with a breakdown to show earnings per $100 of loans, securities, service charges, etc; (3) ratio of net worth to total deposits or to total "risk" assets (all assets minus cash and short-term government securities); (4) ratio of reserve fund to tangible net assets or to total of loans outstanding. All other things being the same, when the net worth of a bank is smaller relative to its deposits or risk assets than that of the average bank in its class, the bank may be *trading on equity* to a dangerous degree. Its credit rating can be improved by selling more stock or by retaining more earnings. Similarly, the ratios may be favorable but the policies so conservative as to repel business customers.

Borrowing from the bank

Because the bank is least willing to take risks it is able to compensate the borrower by charging a lower rate for the use of the money. Thus, bank loans are among the cheapest obtainable, in any given category. When you must borrow outside of the bank your cost of borrowing goes up in proportion to the risk the lender is willing to accept. In a sense it is like insurance. The lender must maintain a reserve in proportion to the risk he accepts to cover his losses.

Usury, in the financial world, is a dirty word. It is the practice of charging excessive sums for lending money, and is punishable by law. In New York State it is possible for the court to confiscate the principal of the loan, or worse. In most states the

maximum interest rate that can be charged is established by law. The common rate is 6% per annum but a larger rate may be allowed for small sums, short periods, unsecured loans, etc. For one thing, 6% on a small loan will hardly cover the cost of preparing the paperwork and checking credit, not to mention collection and other details.

In New York State, as well as in many other states, the laws of usury do not apply when the borrower is a corporation. Primarily, these laws are provided to protect the individual against loan sharks. Thus, you will find that some lenders will provide funds only to corporations.

To avoid the threat of usury, many lending organizations now charge a service "fee" in addition to or in place of the interest. This is acceptable to most borrowers, provided the charge is reasonable.

If you deal with a reputable, established bank or lending organization you can feel reasonably certain that the costs of borrowing will not be above the legal limit. However, and in every case, it is wise to know beforehand exactly what a loan will cost you if you accept it. And the figure quoted prominently, while legal, may not be as inexpensive as it sounds. Study small figures for the small period they may cover.

Be sure that both you and the lender understand how the borrowed funds are to be used and how flexible you can be in using the funds. For instance, most banks and other lending institutions will be most unhappy with the borrower who receives a loan to purchase machine tools needed to fill a new contract, then uses the money, without telling the lender, to buy real estate when the contract is cancelled before work has started.

New equipment needs more money

Another factor to remember when borrowing to purchase capital equipment is that each new addition to your plant is likely to increase your operating expense needs. As an example, suppose you purchase an automatic lathe. Immediately, you must hire or train an operator; you must increase your tooling budget; because the machine is highly productive, your inventory must be increased and you may need additional storage space for raw stock and products; perhaps you will need more assemblers to make the output of the machine pay off; it is even possible that additional sales help must be added to find outlets for your increased capacity; your power bill may be higher. These are only a few of the many details that influence operating costs when new equipment is added. It may be that by replacing old equipment with new, more productive, machines you reduce some of the factors such as labor cost, floor space, and maintenance expense. Nevertheless, there will be new operating expenses and these should be evaluated when the loan is made.

Banks and most other lending organizations expect you to repay your loan and charges by convert-

• CHATTEL MORTGAGE √ Sheet

1 . . Notes—what signatures are required to be endorsed?

2 . . Mortgages

(a) Is rider required on form for merger clause, no oral change, jury waiver, limit on additional advances, etc.?

(b) Insert statement of residence in affidavit of title.

(c) Schedules—are model and serial numbers stated?

Omnibus clause—initialed—signed on last page.

3 . . Certificate Book—make record of stock ownership shown by stubs—initial book at last stub.

4 . . Minute Book

—filing receipt for certificate of incorporation
—are officers duly elected
—amendments to certificate
—bank resolutions
—check certificate for county of corporate residence

5 . . Stockholders' Consent—signed and acknowledged

6 . . Certificate of Consent—verification completed

7 . . Search

(a) Inquire for any change of name or address in past three years.

(b) Check for trust receipts financing Certificate amendments on classes of stocks, section 9 any change of principal office location

(c) Check addresses against proper county or town

(d) Check all realty mortgages, where common title exists, for personal property clauses

(e) Federal tax liens

(f) Previous chattels & conditionals

(g) Judgments and pending actions

(h) Has inspection been made? (dealer in chattels?)

(i) Check ownership of chattels—invoices, books, etc.

(j) Federal Court for proceedings under Bankruptcy Act.

8 . . Guarantee

(a) Straight or collateral

(b) Collateral deposit and receipt

9 . . Subordination—is agreement required?

10 . . Insurance—is amount adequate—are premiums paid—are endorsements ordered—original policies delivered

11 . . Certified copy of order to be examined—must have specific mortgage form attached to original petition and approved—recite order in mortgage

12 . . Franchise tax—receipts or proof of payment

13 . . Lease—is assignment as additional collateral (a) desirable or (b) available—Landlord—deal on sale possession

ing your product to accounts receivable to cash and from earnings on the conversion. It is the only sound way to borrow and very few people will lend you more money than your projected sales and income, or other cash flow, indicate can be paid back without hurting the business.

Some banks feel a slight hesitancy about lending money to small metalworking plants without security because so many machinist-owners lack a sound financial understanding. They are long on technology and short on business ability. One fairly common complaint is that the small-shop owner will take jobs left and right without determining his financial ability to supply the necessary working capital or his customer's ability to meet the payments.

Similarly, many banks prefer lending money to the small shop owned by partners, where one man runs the shop while the other man is out selling, rather than to the shop where one owner must both manage the shop and sell.

In the same sense, a shop with a fairly large number of regular customers and diversified interests is preferred over the company with only one or two customers and a highly special product. Even very good customers have been known to turn sour and leave both the manufacturer and the bank out on a limb.

What lenders want

The people in management are extremely important to lending organizations. Personal honesty, sound credit rating, good customer relations, a healthy financial situation, and a good business background—all have a marked influence on the lender's decision to advance funds. Another important factor is product acceptability. Is your product recognized by the industry and the market? Is its application general or highly specialized? How much competition do you have and what progressive steps are you taking to keep ahead of it?

Financial condition thus gets a lot of attention, and bankers appreciate the shop owner who is aware of his own condition. One survey of small business owners showed that only one man in forty had ever done a ratio analysis of his finances. Owners or managers of small and medium firms should receive from accountants a monthly statement of financial "health" and a quarterly or six month statement of condition, including a projection against the budget.

Whenever you seek a loan, you will be asked: *Why do you want these funds?* It is smart to answer this question for yourself *before* you are asked by professionals. It is easy to find a trite reason, but is it the real reason? If you don't have the answer, your financial statement or your business condition may be far more revealing, even to the point of embarrassment.

Most legitimate lenders will provide funds only to improve a sound business, to make it grow. Very few people will advance money to finance a business on the verge of collapse unless they can see a definite chance of getting it back into the running. And the latter sets up a different set of conditions which will more likely involve investment for profit rather than a loan.

Sometimes, and especially for a long-term loan, the bank or other lending organization will ask for a formal "pro forma" statement or at least an informal projection of your business plans and expectations. The "pro forma" is a tool of financial analysis which provides, in addition to profit and loss and balance sheet statements at the end of an accounting period, constructions of other statements which project the business operations through the next fiscal year.

This projection will show where additional funds are needed and how you anticipate using them. Balanced against past performance and other factors, it gives the potential lender a means of evaluating his chances of repayment.

Every business manager, even down to the shop-foreman level, should prepare a projection of this kind, whether or not borrowing is contemplated, at least once a year. Nothing is more important to planning. It is best to prepare such a statement and analyze it at the stage when you are simply thinking about borrowing, or acquiring additional funds of any kind, and long before you approach a source of the money.

Preliminary analysis may show that the funds are not actually necessary or that the amount you are considering is not enough. It may be that you can find the funds within your own organization. Perhaps you will find that, rather than borrow, you should raise more capital by selling shares in the business, taking in a partner, or merging. Similarly, you may find it wiser to lease equipment used only a small percentage of each year than to buy the equipment and have it stand idle.

However, machine-tool leasing is usually for longer periods, up to 7 to 10 years. The major benefit in leasing is that it enables a company with limited funds to have a machine on the floor and cutting metal for from 14 to 20% of the value of the machine. Also, the "rent" is paid out of earnings and is largely tax deductible. Also, because the machine is leased for a longer period than the maturity on most intermediate-term equipment loans, payments per month are smaller. The over-all cost may be greater in leasing than in purchasing, but the charges are less painful and down payment usually smaller.

A good projection serves as a standard of comparison for actual accomplishment.

Typical of the availability of funds to "blue-chip" borrowers in spite of the tight money situation, and proof that funds do exist for growth operations, is the recent Ford borrowing of $250-million at 4% on *unsecured* promissory notes. The entire amount will be paid to Ford by September 1957 and at least half of it will be spent for machinery and tooling during the next two or three years.

Beginning in 1961, on each November 1 Ford will repay $10-million of the principal amount of the notes and, at its own option, may prepay up to an additional $10-million without premium. Other prepayment may be made at premiums scaling down from 7% of the principal amount during the first year to 3.2% during the fifth year and a more gradual premium rate thereafter. Thus, this is in effect a flexible 30-year loan. This despite the fact that Ford's earnings for the first nine months of '56 are less than half those of the same period last year.

Types of loans

Borrowings, generally, are described by the type of collateral or security placed as a guarantee of repayment. These include the straight-unsecured loan, accounts-receivable loan, chattel mortgage, conditional sales contract, inventory loans, loans on warehouse receipts and "lines of credit" extended against your standing with the lender. Also, it is possible to sell accounts receivable (factor) and to sell your property or equipment to an investor, then lease it back from the buyer for an extended period.

The latter is much less frequently done by banks than by insurance companies and other investors. As a general rule, insurance company borrowing is in such large sums that we are not going into it in any detail in this report.

Among the things most frequently pledged or assigned as guarantees are: (1) inventories, (2) stocks, bonds, and other securities (within the limit allowed by law), (3) machinery and equipment, (4) accounts receivable and assignment of claims, and (5) plant and other real estate. Percentagewise, most short-term bank loans are secured, but unsecured loans represent a greater volume of funds.

The simplest and cheapest bank loan is the straight, unsecured loan, usually made for a period of three to six months, and for which you simply sign a promissory note. Commonly this kind of loan is used to cover inventory, payroll, vacation pay, Christmas bonus, or a variety of other operating expenses. However, an *unsecured* loan simply means that all of the firm's debt-paying ability is pledged for payment of the loan, rather than a specific asset, as a lien.

Pledging a specific asset to secure a loan only protects the lender against the claims of others in the event of liquidation in, or short of, bankruptcy. All of the unsecured lenders divide the return on a bankruptcy sale while the lender with a specific lien gets the first claim to the cash realized from the sale of the asset pledged.

However, pledging an asset owned by the firm adds nothing to the company's debt-paying ability not guaranteed in the unsecured loan. Thus, if the lender wants a stronger guarantee he may require that a third party, such as a wealthy director or officer of the company, pledge something owned outside of the firm, as added protection. This is known as co-signing the note. Secured creditors have the same status as unsecured creditors for any part of their claim not satisfied by the sale of the pledged item; nor are they entitled to more of the cash received for the item than the amount of the loan plus accrued interest.

The interest rate on secured loans is usually higher than on unsecured loans because an unsecured loan is only given to firms having a good credit rating, able to provide complete financial information, operated by highly regarded management, and having other sources of funds. In contemplation of unsecured borrowing, you can strengthen your chances by maintaining a healthy bank balance and, especially, making regular deposits to it. Keep deposits about 25 to 30% of potential borrowings.

Most popular of the loans given for the purchase of machinery and equipment is the chattel mortgage, which is a note or bond executed by the maker (borrower) on specific personal property owned by him. The property may be only the equipment being purchased, but usually other machinery and equipment already owned is pledged.

The note or bond is given to the lender as a lien against the property pledged and it will contain special covenants as to payment, taxes, insurance, maintenance of the property, and action to be taken in case of default, etc. The title to the property is held by the borrower, though the agreement may prevent him from selling, modifying, or otherwise disposing of it without notifying the lender.

When a commercial bank makes a loan on machinery it has a long eye on the business position of the borrower; on the ability of the borrower to pay off the loan out of earnings. When the management of a company is sound, has a good business record, a good earning record to show that the money will be paid back, and a good reputation, it can find a way to get the necessary funds. Without these attributes borrowing is difficult in any market and impossible in the current market, except at very high rates.

In equipment financing, one should remember that the lender will not advance more than the fair value of the property pledged. At no time

To borrow money tomorrow, today you must keep . . .

- **operating costs at a minimum**
- **profits equal with competition**
- **officer's salaries sensible**
- **tax situation liquid**
- **bills and accounts payable current**
- **labor overtime practical**
- **plant and equipment properly maintained**
- **inventories balanced with output**
- **accounting procedures up-to-date**
- **deposits in bank regular**

should the outstanding balance of a loan exceed this value. This decision much depends upon the resale value of an item of machinery or equipment. Remember, too, a new machine becomes second-hand as soon as it is placed in your plant.

You can get the largest loan by pledging general-purpose, name-brand machinery and equipment; smaller loans on foreign-built machines or machines built by unknowns because of the rapid resale depreciation, and the smallest loans on highly special machinery and equipment for which there would be a very small resale demand.

Another method of borrowing is the Conditional Sales Plan, or *New York Plan* as it is sometimes called. Under this plan you place the order with the manufacturer and make a down payment (usually one-third, but this varies) when the manufacturer delivers the equipment to you. However, either the manufacturer or the seller has prearranged with a lender, perhaps a bank or finance company, to buy the "paper." Title to the property remains with the seller until the conditions of the contract are met, one condition being full payment.

When you have made the final payment, the title vests in you and you become the legal owner of the property. There is an auditor's advantage to this type of borrowing because the only debt appearing on your books is the current installment. However, a good accountant will always ask whether any of your equipment is on this type of loan and show it in his footnotes on the statement.

The cost of conditional sales borrowing can be almost anything depending upon the equipment, the lender, the risk, and the amount of work involved. There is almost always a service charge. Most of these contracts are arranged by manufacturers and sellers for their customers. Thus it is wise to be sure before you get involved that this kind of sales agreement has been made with a reputable lender.

Machine tool leasing

Leasing, lease-purchase, or what is sometimes referred to as the *Philadelphia Plan*, is a further way to have the use of equipment without holding title to it, and to pay for this use out of the earnings the machine produces. In a sense, you borrow the equipment itself instead of the funds to purchase it.

Under most of the current machine-tool leasing plans, you can have a machine on your shop floor and "cutting metal" for as little as 10 to 20% of the machine's cost. Machine-tool leasing differs from similar plans for other equipment and construction machinery in that machine tools are leased for longer periods of time—up to 10 years.

Leasing is the answer to keeping the small shop with limited funds, or the fellow just getting started, in a position to obtain the machines he needs. It also is a way of providing special machines or extra capacity for a unique or especially large contract without making a capital investment.

In overall cost, leasing isn't cheap. In fact it is one of the most expensive ways to acquire equipment. *But*, it has the advantage of offering the lowest down payment and, because of the longer term, the smallest monthly payments when compared with chattel mortgage or conditional sales borrowing. Also, all of the rent on a straight lease and the rent portion of a lease-purchase agreement is tax deductible.

Machine-tool builders now providing leasing arrangements include Warner & Swasey, Kearney & Trecker, Norton Company, Do All, Gisholt, Monarch, Jones & Lamson, New Britain-Gridley, and the Rockford Machine Tool Company.

Short-term inventory loans provide another source of funds. Inventory put up as a pledge of payment can be raw stock, work in process, or finished products. Normally work in process is the least valuable because it would have to be completed before the lender could realize cash from it in a bankruptcy sale. Many lenders are cagy about inventory loans because you are constantly using up the property. One technique, though infrequently used in Metalworking, is "field warehousing" in which your inventory is placed in a bonded warehouse and issued to you against receipts which are turned over to the lender. This is expensive because you not only pay interest on the loan, but also the warehousing charges. Sometimes it is possible to enclose your own stockroom and bond a stock clerk to disburse materials.

Inventory loans seldom are available to military contractors where the inventory, or most of it, is supplied by the government, or where the military is the only user of the finished product.

Borrow on money due

In a heavy situation, where capital is inadequate and the physical assets aren't sufficient collateral (perhaps you have invested too heavily and hurt your working-capital position), you might be able to borrow by pledging to a bank all of the accounts owed to you. Actually, you "hock" your invoices.

This is known as an "accounts-receivable loan." It differs from "factoring" in that the bank does not buy your accounts and collect them for you without recourse to you for non-payment. When accounts are pledged for a loan, you collect them and you are responsible. However, you must notify the lender of each bill sent out and each receipt.

Because of the risk, accounts-receivable loans are expensive. Usually there is a service charge in addition to the interest rate.

The "Assignment-of-Claims Act," Public Law 1040, forbids a lender to take an assignment of receivables on government work unless the government is notified and grants specific permission.

In contrast to the short-term accounts-receiveable loan is the real-estate mortgage used, generally, for capital financing of construction, plant purchase, or extensive equipment. The primary consider-

ation is that you mortgage a property that has flexibility, that can be used for more than one purpose. Otherwise the lender would have trouble selling it if you default.

Today, funds for industrial real-estate mortgages are very tight. Normally, you can borrow up to 66% of the appraised value of the property, depending upon the quality and size of your firm and the location of the property. As part of an industrial concentration, perhaps in an "industrial park," your property is worth a bigger mortgage than if it is remote or separated from other industry.

The maximum interest rate on real-estate mortgages is 6% and the actual rate varies with commensurate risk. It is expected that the tight market will raise the going averages closer to the maximum. The basic difference between primary (first mortgage) and secondary financing is cost. While the interest on a second mortgage may be only 6%, people are paying as much as 20% bonus for the mortgages.

Normal brokerage fee for a first mortgage is 1% and sometimes 2%. It may reach 5% in complex loans, but this is high. Select an ethical broker, a member of a recognized society, a real-estate board, etc. Find out what previous results have been shown.

Loan insurance is seldom written as part of an industrial real-estate mortgage but it is gaining considerable popularity in other forms of loans, especially equipment loans. For partners or unincorporated businesses, life insurance to cover the loan is a sensible protective device against the inroads of inheritance tax or legatee's claims if a borrower dies before the debt is repaid. Loss of a partner's abilities or cost of operating during estate proceedings could weaken ability to pay.

• *Funds from finance firms...*

An alternative source of capital is the commercial or industrial financing house. This is perhaps the most varied of all segments of the money-lending field. In it you will find financial giants that rank in resources with some of the nation's largest banks. In it, too, you will find smaller houses that are, in effect, outlets for pools of private capital. Some get their working capital from banks, some farm your loan out to other finance companies—each taking a "piece" of your loan to spread the risk. Still others act as agents for groups of as many as 100 banks. Many specialize in financing capital goods purchasing and metalworking industry plant expansion.

These commercial and industrial financing firms are strictly regulated by law, with interest rates running to a maximum of about 18%, contrasted with bank interest rates of from less than 6 to 10%.

Specialists in metalworking loans

The big finance houses specializing in loans to the metalworking industry, such as Chicago's Walter T Heller & Co, seldom touch loans for less than $15-20,000, although they have no rigid minimum limits. The ceiling on loans is virtually unlimited. As with banks, and you'll find this applies to any reputable source of loans, the financiers have absolutely no desire to "speed a company to the graveyard in style."

Ten years is just about the outside limit that the finance companies will allow for repayment, and that comes under the long-term loan category. As a rule, although there are exceptions, finance houses prefer to make intermediate-term loans (3 to 5 years).

While the interest rate on the intermediate-term loan is relatively high (18% maximum as against a 10% maximum for a long-term bank loan), it has advantages to the borrower. For instance, the "down payment" is flexible.

The term-length of the loan is more adaptable to the wishes of the individual borrower, and to the projected earning power of, say, a piece of new equipment for which the loan is made. Not only that, finance companies generally offer the borrower the privilege of prepayment without penalty if his earnings prove greater than expected. They will make reasonable extensions, too, if earnings lag, or if something unforeseen comes up in your program.

Another intermediate-term loan advantage is, in the jargon of money circles, the "purchaser's obligation is not callable," meaning that you don't have to list the whole debt as a current liability on your books—only the current year's share of it. This leaves your credit in better shape. And, perhaps most important of all, according to Heller's Industrial Division Director D L Salinger, the terms of the loan are based not only on the borrower's balance sheet and his character, but upon the additional earning capacity resulting from use of the money.

How a finance house works

Let us here give an example of how one of the bigger private industrial financing houses works. It finances purchase of machine tools and other industrial equipment on a deferred payment basis, using as security either a chattel mortgage on existing equipment, or a conditional bill of sale.

It seldom lends less than $15-20,000. An exception is the case wherin a plant wants to buy, say, a $3000 grinder from a machine-tool distributor. In such cases, the distributor usually has a running account, quite often turning up 200-300 such small loan requests a year. The loan is made to the vendor who in turn sells the machine on the installment plan. In that way the vendor doesn't have to worry about collateral—the machine is his, even if it's in your plant, until fully paid for.

Incidentally, you'll find it much easier to get a loan for purchase of an American-made machine tool than for a foreign one.

What does a finance company recommend as most favorable to the customer? That depends on a lot of factors, such as the amount borrowed, how much new equipment is desired, whether the borrower is enjoying an era of prosperity in which he can pay off the loan in a short time, or whether he needs as much time as possible to take advantage of the production gains resulting from the use of the new machines or the additional manufacturing space gained from expansion. At least one lender believes the borrower will do best on loans up to five years, paid in equal monthly installments: or on a plan based on the tax depreciation writeoff of machine tools and similar production equipment.

"Free-Wheel" your thinking

Heller puts it this way: after you have decided what you want and about how much it's going to cost you, sit down and figure out realistically just how fast you can and should pay for the machine. Don't apply a straitjacket to your thinking, or take someone else's word for it that the orthodox loan calls for 25% down with the balance in equal monthly payments over a year. Each company, says Heller's D L Salinger, has its own way of operating—its own financial and production structure.

Maybe your competitor can afford a "cash down" payment of 50% on a machine. That's all very well if it doesn't deplete working capital to any great degree, because the bigger the down payment, the smaller the payments and the smaller the interest charges. But your own case may be different. Either way, the balance left after the down payment must not be more than you would be willing to pay for the machine if offered to you for sale used.

This balance should be divided into as many payments as necessary to bring each payment into range of your ability to meet it comfortably. If at any time during the loan, the machine cannot be resold for at least as much as the balance remaining to be paid on it, your term of loan is too long. If that is so, you and your supplier should arrange to (1) increase the down payment, or (2) consider a different model, or (3) revamp your production methods.

When making a loan, Heller recommends that you scale your payments so that they're heavier in the earlier years. That's because the machine is more efficient and profitable in that period and tax depreciation is heavier. Consequently the "pay more early" idea allows the borrower greater down-payment freedom, more scope in choosing the period over which the loan is to be paid, and it closely approximates the "pay as you earn" ideal.

One limitation on intermediate-term equipment financing is that the acquisition of a piece or two of equipment usually only solves part of the borrower's problems. Take this example, cited by Heller: a new installation may increase your production by 50% and your sales proportionately. Thus if you were carrying, as a result, $100,000 in account receivable before, the sum has been upped to $150,000. That's why many financing firms have developed auxiliary services that enable the borrower to work out a complete financial management program at the same time that he buys new equipment. This means that several industrial financing firms have branched out in recent years into factoring of accounts receivable and inventories and into actual financial management of a company. Finance houses would much rather have you as a steady client, rather than as a one-shot borrower, hence they find it to their own benefit to help you steer clear of financial pitfalls.

Again look at some of the ground rules on lending that are typical of the bigger finance houses. Say you want to borrow $100,000 for a new production line. Before you start, the lender will ask you to put up from 10 to 33-1/3% of the purchase price. As a rule, the motto is "no down payment, no loan." It will want to know the value of (1) your accounts receivable, (2) your real estate, (3) your inventory, and (4) your plant and equipment. It will want to know what liens, if any, are held against any of those assets. The finance firm is interested in your business character and record, because your ability to pay is the primary guarantee of the loan. Your assets are merely insurance against failure to do so. With most financial houses, a corporation stands a better chance of getting a loan than an individual or a partnership.

Alternative types of loans

If your $100,000 loan is okayed, you'll be offered either of two alternatives: (1) a plan based on the sum-of-the-digits method of writing off tax depreciation on a piece of new machinery. It works this way (assuming you're borrowing the $100,000 over a 10-year period): You add up the digits for each of the 10 years of the loan (1 for the first year, 2 for the second year, up to 10 for the last year of the loan). On a 10-year loan the digits add up to 55. Under the plan, you pay 10/55ths of the loan the first year, 9/55ths the second year, and so on down to 1/55th the tenth year. Interest by this method comes to 4¼% of the unpaid balance for each year of the loan, averaging out at a little over 11% per year. On a five-year loan you would pay 5/15ths the first year, 4/15ths the second year, down to 1/15th the fifth year.

• Most common type of loan is repayment in equal monthly installments over a stated period of time. While charges vary somewhat, interest rates customarily run 6% for each year, applied to the amount to be advanced.

Within the industrial financing group, smaller than top-rated Heller, is Coastal Commercial Corp of

New York City, geared to handling the financial problems of the small metalworking shop. Coastal, unlike banks and larger finance companies, is less interested in the financial and business character of its borrowers than in tangible assets to secure a loan. "In essence, we're a hockshop for industry," is the way Coastal's president Franklin Elias puts it.

When you go to Coastal for a loan, Coastal will take a "piece" of it, say 10 to 20%, farm the rest out to individuals and other finance houses, with none taking more than 10% of the loan. This spreads the risk so that none of the participants gets hurt much if the borrower fails to meet the loan, and if the security fails to meet the outstanding debt. Because of this, Coastal's operations are extremely flexible and the company frequently finances firms that no bank and few other finance companies would touch.

Coastal will make you a loan in any amount from $7000 or so on up, with no top limit. Its interest rates are 1½% per month. This runs to somewhere between 15 and 18% a year. Unlike banks, although it offers infinitely more in the way of services to its accounts, Coastal has no service charges. Maximum length of loan is three years, preferably two years or less.

The smaller finance houses

There are a number of important differences between lenders like Coastal and the larger companies such as Walter T Heller: Coastal, in a sense, might be described as a personal finance company to industry whereas the larger lenders operate closer to the principles of banks. Typical of this difference is that the bigger firms are primarily concerned with financial statements, credit rating, business stability, and the human factors while Coastal's evaluation is largely in terms of the physical assets you can pledge. While it is comparatively rare for a large lender to ask an appraiser to look at your property or business health, the smaller lender does this in almost every case, especially for the new customer. The smaller lender will take a greater risk, after closer scrutiny, and will charge a higher rate for taking it.

While the larger organizations deal on the merits of people, the smaller lender may base his decision on specific *situations*. Similarly, the small lender can provide smaller loans than might be available from large firms with heavy overhead. For one thing, he can watch his money more closely.

Don't expect to get money from any finance company if you are a "dead horse"—if you want to borrow money, for instance, to keep from going bankrupt, or to try switching to a new product line. All of these organizations base their business on growth. In fact, it is seldom that anything but a growth situation for the borrower will warrant payment of the rates involved.

Generally, loans guaranteed by fixed assets are made only to manufacturers, against manufacturing

NEW CLIENT - - - GENERAL INFORMATION
EXECUTIVE COMMITTEE APPROVAL

Date_____, 19___
Prepared by:_____

Name of Customer _____
Principal Office _____
(ADDRESS) (CITY) (STATE) (TEL. NO.)
Branches, Plants, etc. (Name, Location, Description of Activities, Person in Charge, Leased or Owned)
_____
In Business Since _____ Incorporated At _____
Business Year-End _____

TYPE OF BUSINESS:
A: Industry _____
(WHOLESALE, JOBBER, MANUFACTURER, RETAILER)
B: Product _____
C: Price Line _____
D: Raw Material Used _____
E: Own Shop or Contractor _____
Trade Names Used in Billing _____
Affiliated & Subsidiary Companies (name, location, description of activities, inter-company transactions, percentage of ownership)
_____

STOCKHOLDERS AND OFFICERS

NAME	ADDRESS	TITLE	NO. SHARES OWNED
NAME	ADDRESS	TITLE	NO. SHARES OWNED

Names of Controller, Office Manager, Bookkeeper
_____

BANK ACCOUNTS: Name of Bank & Branch Authorized Signature
_____
Customer's Accountants (Name and Address) _____
Customer's Attorneys (Name and Address) _____
Restrictive Agreements: _____
State to which Payroll Taxes are Payable _____

SPECIFIC FINANCIAL INFORMATION
Net Worth _____ As at _____ Began Business _____
Subordinations $_____ Total N.W. & Sub. $ _____
Sell To _____ Average Collection _____ Days
Accts. Rec. _____ Ageing _____
_____
_____
Sales Terms _____
Sales Volume _____ Period _____
Sales Returns _____ Average Discount _____
Age of Accts. Pay. _____

ARRANGEMENT:
Commission of _____ TO: _____
% of Advance _____ # of Days Clearance _____
Notification _____ Non-Notification _____ Sty: Letterhead Statements Yes ☐ No ☐
Rate to be charged _____ % Minimum Fee _____
Mortgage Loan _____ Accts. Rec. Loan _____ Amount _____
SPECIAL AGREEMENTS such as: Proof of Delivery _____
Other _____
_____

REPORTS AND DOCUMENTS ATTACHED
Accounts Rec. Agreement _____ Individual Guarantee _____
Resolution _____
Dun & Brad _____ Daily Cr. Bulletin _____ Proudfoot's _____
Special Report _____ Financial Statement _____ Tr. Receipt Clear _____
Factor's Clear _____ Subordination _____ Gov't Lien Clear _____
Former Factors _____
Releases Required: _____

SUBMITTED AND RECOMMENDED BY:
_____
Title _____

COMMITTEE DISPOSITION

equipment, and not to distributors, dealers, etc. However, an established distributor might be able to work out conditional sales contract arrangements between himself, his customer, and the lender. Similarly, only A-1 engineering firms have the kind of assets and security needed to guarantee payment.

Suppose you need funds to start a new business? All of the finance houses will tell you, "Get the money from your friends and relatives. It's far too risky to touch any company that has no manufacturing history."

However, there are organizations, such as the American Research and Development Corporation, Boston, working with electronic firms, which have venture capital to invest if you can prove your case.

One of the small industrial finance companies, specializing in small businesses, provides several services for its customers. It has its own engineers and its own auditors. They're available to help the customer evaluate and carry out a new contract, to advise on the amount of new equipment you can safely buy, to evaluate your financial position, suggest ways to cut down on taxes (legitimately, of course), and to overcome many problems common to the small plants that can't afford extensive financial and engineering staffs. Beyond the fee for the money borrowed, there is no charge for these services, other than that you pay the expenses of the auditor's or engineer's trip to an out-of-town (New York City) plant. Only when specialized outside help is brought in do you pay for the advice.

The only requirement for this service is that you borrow funds to the extent that your monthly fee is never below $100, which is about $7000.

This service angle may indicate a trend to providing a financial management, or comptroller, function for small business. Certainly, the complexity of today's business operation makes it interesting.

• Factoring: Selling your invoices today...

Two new methods of financing metalworking operators have come into more and more widespread usage in recent years: accounts receivable financing and factoring. Some companies will provide funds on either basis.

Factoring involves outright purchase of the money your customers owe you. For example, one of America's "old line" factors, Mill Factors of New York City, will consider advancing you money if your product is what it calls "fungible"—a standard mass-produced item—rather than a few-of-a-kind special product. Say you're a maker of metal fishing-tackle boxes selling to 200 different outlets. Some pay in 30 days, some in 60. You need money right now—not in 30 or 60 days when your accounts are to be paid. Mill Factors buys your accounts receivable outright from you at a discount that varies with the risk of collection. This is not a *loan*, but purchase of your accounts receivable without recourse to you if the factor cannot collect.

Accounts-receivable financing

This company also offers accounts-receivable financing, which differs from factoring in that Mill Factors makes you a loan on the value of accounts receivable. The accounts are still yours, and the responsibility for collecting them is still yours. If you factor your money costs you six percent per annum and you pay a service charge of not over 1½ percent on the amount of receivables purchased.

If you finance, you pay an interest charge on the amount of money borrowed which, of course, is often somewhat higher than six percent per annum.

Both factoring and accounts-receivable financing are designed to serve the customer who has a high turnover and a seasonal business, and who has a mass-production product. Mill Factors will not factor a customer who has less than $350,000 annual sales volume, nor will it arrange loans of less than $25,000. On a $50,000 loan, your receivables must be worth at least $60,000. On a factoring basis, Mill Factors will handle an annual customer sales volume as high as $18 to 20 million. It will finance loans as high as $1 million. In the metalworking field, so far this company has factored the makers of refrigerators, air conditioners, and freezers, and distributors for those products. It will factor only at the manufacturing and wholesale levels, not at retail. Its commercial financing has encompassed all sorts of metalworking firms, particularly those in the housewares and electronics fields. But it is well to remember that its services, like the score-or-so of other U S old-line factors, are not for the weak customers. "If you're taken on by an old-line factor, you can be sure you're a strong company."

Lending against inventory is another service offered by factors which is invariably tied in with factoring or financing of accounts receivable. You can get a loan on your raw stock, stock-in-process and finished products. Old-line factoring firms also make chattel loans and unsecured overdrafts on a seasonal basis. Many factoring firms, in short, will make you almost any kind of loan that a bank will and perform other services that a bank is not equipped to handle.

But the factors do not want to do this on a one-time basis. They prefer, like banks and finance companies, to keep you on their books on a first-name, continuing relationship. In the textile industry, long the mainstay of the factoring business, the factoring of accounts receivables and of inventory is done almost with the regularity of an individual using his checking account.

Factoring is designed to aid the "light-heavyweight company"—one that is pretty good sized, but just a little too small to go in for public financing, such as floating of stock and bond issues. Factoring has not reached nearly the degree of acceptance in the metalworking industry that it has in the textile industry, where a tremendously fast turnover of capital is the rule. And it probably won't be as popular in Metalworking until virtually every type of metalworking firm participates in factoring, as is done in the textile industry. Factoring boils down to this: "A purchase of receivables so that you have no money tied up that is not working for you."

• Public financing; Stocks and bonds to raise capital...

Public participation—the floating of stock and bond issues—is in the top bracket of financing. Although one form of public financing is probably the most basic of all ways to raise money—inviting your friends and neighbors to take shares in your business—generally this form of raising money is for the medium-to-large-sized company, not the little fellow.

Before you plan to issue stock or bonds and if you have never done so before, discuss the idea with your banker. Give the bank a breakdown of what you want the money for (to buy machines and equipment, plant addition, new plant, more real estate, etc). It's possible, but not probable in these days of tight money, that you can get a 5 to 10 year term loan or a mortgage to cover your needs, instead of issuing stock. In this way, you avoid sharing control of your company with others.

The bank's approval of such a loan would depend largely upon whether it has the money available; whether you, as the owner of a company, would be willing to sign a formal agreement in which the bank would have the power to make you agree to maintain a given amount of working capital, and would place restrictions on leasing and mortgaging of property, etc. The bank would definitely stipulate what the loan is to be used for.

If for those or other reasons (such as your refusal to accept the loan because its rate of payoff is in excess of what you believe you can afford), you might try insurance companies. This, too, is a means of getting a large loan without having to share control of your company.

While an insurance company would ask a higher rate of interest than a bank, it would grant more lenient terms of repayment—as much as 30 to 40 years for a "blue-chip" company, and 10, 15, or 20 years for a medium-sized one. In the latter category, the term of the loan would depend upon its protection in the way of tangible property such as real estate, plant, and machinery. Insurance companies are mainly interested only in the larger loans, consequently, they will make a thorough investigation of your assets, often employing a management survey company, such as Ebasco Services Inc, to do the job. If you do get together on terms, the insurance company is more than likely to offer you a mortgage rather than a term loan; or to arrange a "lease-back."

First, you can float a public bond issue. Here the same considerations apply as in private placement, because a bond issue is a form of loan. To issue bonds, the procedure is to go to an investment banking house, which sells your loan in pieces to a large number of lenders. You must secure your debt, and you will be restricted against borrowing elsewhere, and against other mortgages, leases, etc. The investment banker sets up the issue and underwrites it before selling it publicly, and in addition a trustee is appointed to safeguard the interests of the bondholders, whose rights are written into an indenture. Carl M Loeb, Rhoades & Co puts a minimum on such a public offering: it's $1 million.

Convertible debentures or bonds may be preferable to a straight-bond issue. In this method of financing, the bondholder not only gets the security of a bond, he gets a "play" on stock if your company does well. The investment banker may suggest this as a way of "sweetening" your bond issue.

Here's an example: a truck manufacturer recently pledged its receivables to put out a "subordinated" convertible (a sort of "junior" debt that has "senior" debts like bank loans ahead of it, in the manner of a second mortgage). This gave the truck company two advantages (1) it made the deal "do-able" in the language of Wall St, and (2) it made it "do-able" at a lower interest rate.

But this conversion-to-stock feature has its drawbacks to the borrower, too. It means your equity in your company might be diluted if your firm's

stock reaches a point at which conversion of the bonds to stocks becomes worthwhile. That means that you have to share ownership, control and profits from your business with others.

Still another method of public financing is the issuance of convertible or straight preferred stock. Biggest advantage of the latter method is that your firm is not saddled with a debt, or with fixed charges if a recession hits. It's best for a company that somewhat lacks stability—one that might have to give its voting power to its preferred stockholders if it had to skip a dividend or two.

Small-to-medium-sized companies that lack established credit on a big scale may find the issuance of convertible preferred stock the best method of public financing. This means that your firm's preferred stock, which is limited in value but is always paid off before common stock dividendwise, is convertible to common stock if the common stock should go higher in value. Although it's not always true, conversions usually run 10 to 15% above the market, and if a company's credit is good they sometimes run even higher. But the drawback to the convertible preferred is that it dilutes your equity in your company. Convertibles are good if you have a profitable business without much plant and equipment.

Issuing common stock

Then there's issuance of common stock, which is particularly good if you want to keep your capitalization simple, and you don't want any prior claims on your assets or earnings. There is no bottom limit to flotation of common stock. In its simplest form, you merely go to your relatives, friends, and business acquaintances and offer them so many shares in your enterprise—sink or swim. It's not necessary to register a small issue of common stock if you don't use the mails to sell it. If you do use the mails, this comes under the aegis of the Securities & Exchange Commission and you must register your issue with it. Registration requirements aren't quite as severe if your offering is for less than $300,000, and that's one reason why a lot of firms issue exactly $299,999.

In a common stock issue involving upwards of $300,000, a company must file a registration statement with the Securities & Exchange Commission giving details about how much business you're doing, how much you expect to do, what liens you already have against your business, etc. Everything must be audited, and you might also furnish opinions on, say, your firm's engineering, market, or financial status from outside experts. This registration statement is filed with the SEC by your company, while your investment banker furnishes SEC with information on how you plan to offer the stock.

SEC may send you a "deficiency letter," which asks you to explain certain not-quite-clear aspects of your registration. In that event, you must file an amendment to your original registration. It is possible to have the registration paperwork done by an outside firm of financial or management consultants, and your investment banker will also work with you in arranging audits, hiring lawyers for you and for the investment banker. In all, if your audits are all clear, it'll take a few weeks to get your information into the hands of SEC, then about 20 days more for clearance of the issue.

Remember, in a public offering you must divulge all the information you give to the SEC to the public, unless SEC will excuse you on grounds that the divulgence of such information would hurt your firm in a competitive sense. And be prepared to give your investment banker such "off the record" information as your marketing plans, breakdowns of your cost figures, etc. The banker may or may not ask you for it, but such information will be held in strictest confidence in much the same manner as a lawyer-client relationship.

Where do you start?

If you want to know where to begin in public financing, consult your local bank or stockbroker for advice. Bring along with you a balance sheet and earnings statement covering your earnings back as far as possible. Also be prepared to tell about the experience of your executives, your firm's history, and above all about its plans for the future—specifically what you plan to do with the money you raise. Don't just walk in and say "I want a loan." The more detailed information you can provide, the easier it will be to arrange financing.

Taxwise, it's well to remember that if you raise money on a debt issue, the interest on that debt is deductible—$50,000 comes off before you start figuring taxes—but if you issue preferred or common stock, the dividends are not deductible. Interest on a convertible bond is deductible only if it is not converted. That's one reason why some companies, particularly the railroads, today are exchanging their preferred stock for debentures.

Just what are the mechanics of public financing through an investment bank? First off, investment banking is just another name for the underwriting of stock or bond issues. The investment banker takes the risk on your offering because he guarantees (underwrites) to you that you'll get a certain amount of money, and then he has to raise that money from outside sources.

Suppose you go to Loeb, Rhoades or another investment banking house, and they tell you, "We think we can do business. For 50¢ to $1 a share we'll underwrite your issue." Then the investment banker arranges for you to file a registration statement with SEC. When that's been done and cleared by SEC, the banker signs a contract with you for himself or himself and associates, who may have agree to take a specified number of your shares.

Then another SEC amendment is filed, and your

stock is offered to the public. About two weeks later you receive your money from the investment banker, by which time your stock should be all sold off by the investment banker and his associates.

Normally, you pay the expenses of registration—things like a prospectus, lawyers, auditors, etc.

No matter how desirable a stock may seem, no matter how many people are waiting to gobble it up the minute it gets on the market, it must be offered to the public at a predetermined price per share. In other words, say that the public knows you're putting out shares at a par value of $5 each, and it thinks the stock is worth at least $10 a share. Nevertheless, on opening day your shares must still go on the market at $5—then the price can shoot up in trading, but not before.

• Dollars to prevent disaster...

When you have tried all of the regular sources of funds without success, where can you go? It won't be easy to find the money. Even friends and relatives hesitate to invest in a problem situation. However, there are emergency sources of funds which might keep you on your feet.

At this point, however, you should reappraise your own situation something like this: If you have a business that is worth money to you, it should be worth something to someone else. When everyone refuses a loan, perhaps it is time to reconsider whether the business would improve by putting in additional funds.

If it won't improve, you are simply throwing good money after bad or, as one fellow puts it, "paying for a fancier funeral." This is no healthier for you than it would be for other investors or lenders. If only a loan shark will give you the funds, beware. He may be figuring on a nice profit when he repossesses your property.

Before you accept this kind of money you should do the thing that should have been done when you first considered borrowing. Reconsider and evaluate what you might offer in property and services as a means of raising money internally.

For instance: Can you sell some of the machinery not necessary to your current production? Are you carrying excess inventory that might be turned into dollars? Is your payroll excessive, particularly as regards officers' salaries and overtime charges? Can you rent out some of the plant floor space, either to another company or for storage purposes? Can you cut sales cost by using dealers and distributors? Can you get quicker payment of accounts receivable by offering a discount to your customers, or can you speed up delivery on delayed-shipment contracts by the same device? What unused assets can be sold or rented to provide working capital?

Sometimes it is possible to find a partner who will either advance funds or cosign a loan, although finding partners is difficult when you wait until the pressure is on. If you do accept a partner, don't seek only the financial benefits. Try to find a partner who will complement your talents with his own. If

Small Business Administration

In theory, although not always in practice, the last recourse for a small firm in getting a loan is the Small Business Administration. Up to now, getting a loan from SBA has been more difficult than getting one from a bank. But today, SBA's appropriations have been increased tremendously and its borrowing policies have relaxed considerably.

SBA steps in when you have been turned down by at least one private financial organization on "reasonable" (not usurious) terms. It cannot make a loan if other capital is available to you. In other words, if a bank or a finance company will lend you $10,000 of the $20,000 you want to borrow, SBA can lend you up to 90% of the balance, or if you can't get any money elsewhere, SBA will lend you 90% of the whole amount.

SBA has three types of loans available: (1) direct loans up to $20,000; (2) immediate participation (where either SBA or a bank buys a share of the loan to $50,000); and (3) deferred participation loans up to $50,000, in which SBA agrees to purchase from a bank a given percentage of the balance of your loan at time of purchase on 10 days' notice.

Don't be misled. SBA is not a charitable organization. It is interested only in assisting sound businesses. Its maximum loan is $250,000, but several small firms may merge into a single corporation and get a $250,000 loan for each participating firm. The loans are repayable in regular instalments, usually monthly. Interest rates do not exceed 6% per annum. No loan can extend beyond 10 years. Collateral required may be a mortgage on plant and equipment, or assignment of warehouse receipts.

SBA application forms are available at all of the agency's local offices, by phone or letter, but it is preferable that the borrower call in person to discuss his problems and receive free counselling service. To save time, take with you: a copy of your current financial statement, and a profit-and-loss statement for the last three years or as long as you've been in business. This insures that you will get a "yes" or "no" quickly and that your application is correct before SBA takes action on your loan.

you run the shop, look for a man with contacts and selling ability. If your forte is selling, try to get a good engineer-manager or shop man.

Another answer to survival when the chips are down is merger. Try to arrange consolidation with another company. You may have many intangible assets, such as specialist personnel and a line of accepted products, which are worth a lot to another firm even when you cannot borrow as much against them as with more tangible assets.

Process evaluation is a method for cutting your operating costs but it may be too late when you are in a pinch. However, if the pinch is only on paper as you project operations into the coming year, study each of your methods in the light of modern practice. Find which operations can be eliminated, combined, or contracted for cheaper on the outside. Replace obsolete equipment. Tighten your paperwork. Eliminate unprofitable products and services.

Cooperatives

One other method by which the small company can improve its business strength is to join a cooperative, or to form a cooperative with other small firms in the industrial area. Admittedly, such groups are not readily assembled and personal differences, or jealousy over who gets the contract, can seriously strain cooperation. Nevertheless, some very strong organizations have beeen formed.

Thus, by pooling talents—purchasing, sales, technical skill, management know-how, financial services, and even facilities, the cooperative can achieve recognition and standing, as well as lowered operating expenses, beyond the reach of the average privately operated small shop.

Generally, it is wise to hire an independent professional manager to head up the central organization and act as moderator in disputes. This avoids the criticism of an interested-member manager as partial to his own company. Also, the viewpoint of an outsider is usually broader.

Funds to start a new business are seldom available from conventional lending sources such as finance companies and banks unless you have property to pledge or someone with property will countersign the note. It is best to start within the limit of your own ability and prove your idea successful, then you have a better offer to friends and/or relatives in asking for additional funds. It might be possible to borrow from a money lender against some good contracts or definite orders. Or you may be able to sell stock locally or by underwriting through an investment banker.

Secondary financing is funding subordinate in collectability to other types of loans, such as a "second" mortgage. It is very difficult to get and it is costly. If possible, you might find that it is more practical to refinance a first mortgage with new terms and maturity, and for a larger amount, than to carry a second mortgage.

Emergency funds are available from a number of government sources. One of these lenders is the Small Business Administration of the Department of Commerce. As described elsewhere in this report, this organization can lend you money only if you have been turned down by a private lending organization.

State and local aid

Another source of money is the state emergency fund or the offers made by distressed areas. It might be practical to move to one of the latter areas rather than go out of business. However, the distressed areas are primarily concerned with providing employment, hence your welcome will depend to a considerable extent on the number of jobs your business offers to the community. Plants, and occasionally equipment, have been offered rent and tax free to encourage companies to get a fresh start or expand in some communities.

Typical of this is the Commonwealth of Pennsylvania's industrial development program. Administered by the Pennsylvania Department of Commerce, this program has $5-million to encourage growth in industrial communities. Experts will help you locate and plan the type of plant you need. Some communities may even build a plant for you. With rent and local taxes out of your operating expenses, this may be the answer to catching your breath and getting a fresh start.

Other states and communities have similar industrial development and emergency funds. New York State has a $50-million emergency fund for business loans, yet surprisingly few people have asked for loans, perhaps because the people most needing help are not aware that it is available.

One way to keep your head above water may be to concentrate all of your effort on one line or product which is profitable and shelve the rest. Concentrate available effort and funds. Turn the remaining effort, equipment, and space into cash or get rid of it. Thus you keep the organization alive for future rehabilitation and growth.

We appreciate . . .

the help, advice, and cooperation of the following organizations in the preparation of this Report:

D H Blair & Co
Chase Manhattan Bank
CIT Corporation
Coastal Commercial Corp
Franklin National Bank
General Public Utilities, Inc
Walter Heller & Company
Carl M Loeb, Rhoades & Co
Manufacturers' Trust Co
Mill Factors of New York
NY State Dept of Commerce
New York Stock Exchange
Pennsylvania Dept of Commerce
Rosenthal & Company
Small Business Administration, Commerce Dept

Mention of any organization, at any place, in this report neither constitutes nor should be construed as either a recommendation or, in any way, a condemnation of its practices and policies.

Round Table

Fishin'—for Skills

"I hear you're having a hard time getting a man for that boring mill over there, Al. Not enough qualified possibilities, I suppose."

"Not at all, Ed. We found a very good man—on the outside. I was all set to hire him when Hammond started kicking up a fuss. He wants us to upgrade him and train him for the job—which he can't handle now."

"That'll take some time, Al. Might be a year before you could put him on his own."

"I know, and that's why I'm determined to get the man from the outside. He's fully qualified, and can start turning out work immediately. I'd like to get Harrison to tell Hammond off, but he's stalling."

"Maybe he's worried about labor relations, Al. After all, we have made a general policy of upgrading from within. It wouldn't do morale any good if you just ignored Hammond."

"Sure, Ed; but we don't have a fully qualified man on hand, right now. In this case, we can get a man from outside. I think we should grab him while we can."

"Might not be the best thing, at that, Al. We do have an instructor on the boring mills, so Hammond could be doing work under supervision. I know it would be a fine thing to grab off an experienced hand for the mill, but there may be times in the future when you'll have to promote a non-qualified man. If you discourage the men now, there may not be anyone around in the future to be promoted."

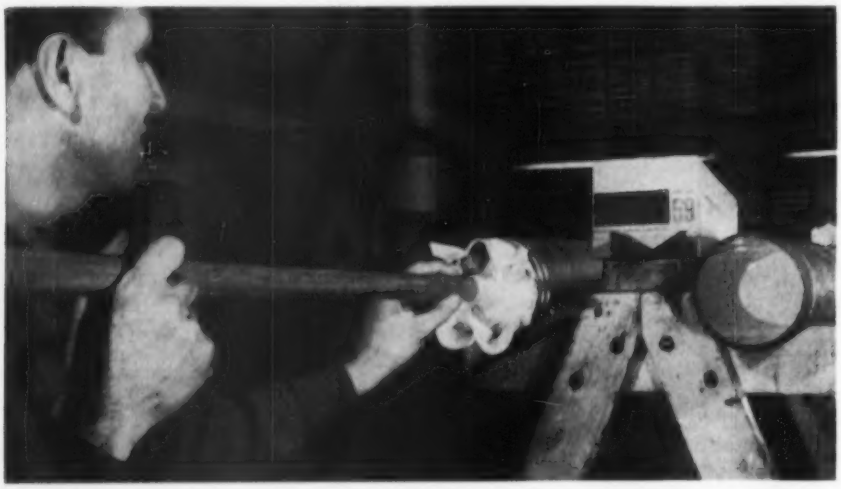
"Oh, I don't think just one case will make that much difference. Besides, Ed; aren't we supposed to get the best available men for the work? That's sound management policy."

"Maybe it is, Al; but it's also sound policy to keep up morale in the shop as much as possible—it boosts production when it's high, and it cuts it down when it's low."

***SHOULD** Al fight to get the experienced outside man, or should he follow Ed's advice and promote the less experienced man from inside? Your opinions may help guide others with this problem. Discussions of earlier topics start on page 206.*

Piston shafts . . .
are covered with protective oil during storage and must be cleaned off before use. Paper wipers insure a scratchless job, and the high absorbency of the paper makes for cleaner, faster work. Note that shaft is supported on wipers in V-blocks

Finished parts . . .
are handled with paper wipers to prevent corrosion by skin acids, and rest on paper in the storage racks. Wipers are discarded after being used once, so cannot carry abrasive material to score work



Recoil cylinder . . .
bores are honed to 1.5-mu in. finish and are wiped clean before assembly with a paper wiper on the end of a wiping rod. By using a fresh towel for each, danger of scoring is avoided

Look, No Hands

Bare hands never touch the finely finished parts of a recoil mechanism. Instead, industrial paper wipers are used for both handling and cleaning

There are some jobs where the requirements for wiping are considered as part of the engineering of the product. The Brooklyn works of American Machine & Foundry Co has found, for instance, that cloth wipers can endanger the highly finished surface needed for the recoil mechanism unit of the Army 75-mm gun. For this particular job, specifications require several parts to be honed to a mirror-like surface finish, internally and externally. Rags,

Silver residue . . .
from seal rings is wiped off piston rod after each stroke of test gymnasticator to prevent scoring rings and rod on return stroke. Operation is repeated until rings are run in and deposition stops

Perfect alignment . . .
of component parts of recoil mechanism is insured by wiping all parts with paper wipers to remove all foreign material that might cause misalignment and to avoid scoring highly finished surfaces

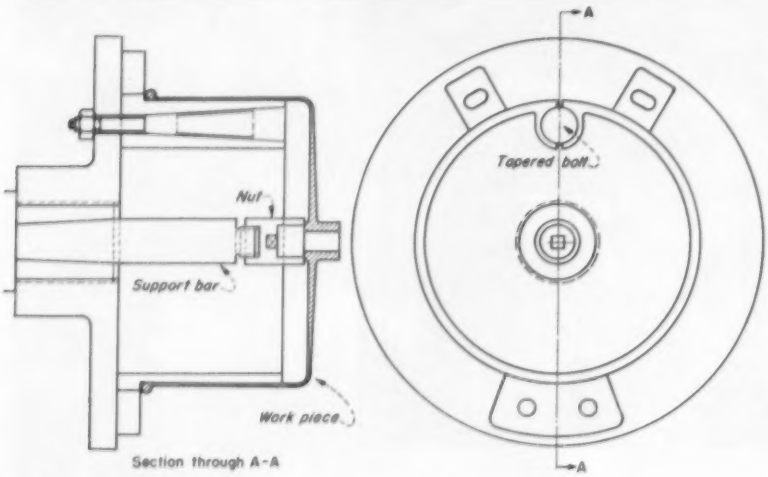
Silver seal rings . . .
require careful handling because of their softness. They are kept clean and free from damage by wrapping in paper wipers taken from dispenser carton as needed

even when freshly laundered, sometimes contain fine bits of metal or lint and, if used to wipe a surface having a 1.5-mu in. finish, would ruin the work.

To answer the wiping problems, the company turned to a new type of disposable paper wiper developed by Scott Paper Co. Made especially for industrial use, it is free from lint, and its two-ply construction makes it strong enough to withstand all the wiping of sharp edges and unusual contours.

Still another danger in handling mirror-like finishes is that of skin acids. The palms of the hand produce a weak hydrochloric acid that can cut into the finish. Because of this, parts are never touched by hand, but carried about with paper wipers. Rags, particularly, if they have been used for any length of time, will retain this skin acid. The great advantage of paper wipers is their easy and quick disposability after use, thus eliminating the acid problem.

Practical Ideas . . .



Thin-Wall Drum Expanding Fixture

We had a lot of light aluminum castings to machine recently. The fact that the wall thickness of the casting was less than ¼ in. and the finished thickness just 0.079-in. presented quite a problem. The parts had to be machined all over, so ordinary chucking methods were useless.

The inside bore, hole, and bottom was machined while the part was held in a strap fixture. We made this by rolling a length of steel plate. Four pads were welded to one edge to bolt to the faceplate, and two plates were welded to the butting ends to take the clamping bolts. The fixture was then fastened to the faceplate and bored out to suit the periphery of the casting.

Before machining the OD of the casting, we had to take into account the vibration factor. We therefore decided on the illustrated maximum supporting fixture, which holds the casting internally.

We ordered a cast-iron ring, and faced off the back end so it could be fastened to a faceplate made for the job. One large pad, opposite the slit, accommodates the two bolts holding the fixture stationary. Two pads, located one on each side of the slit, are what we call the sliding pads. Their elongated holes compensate for the slight motion created in expanding the fixture.

The internal boss intended for the tapered bolt is bored with a taper of about 7°. It is then slit through the center of the bore. The OD is machined after the expanding bolt has been fitted to the bore and through the faceplate, without pressure exerted on it.

An adjustable support bar is made and fitted to the headstock spindle. This is regulated, after the work has been mounted and gripped on the fixture, and sliding pads tightened, by means of a square key through the center hole of the casting. The nut thus brought to bear on the inside face, but not hard enough to create distortion, will dampen vibration in the facing operation.

As the face is not perpendicular to the axis of the bore, a cam is mounted across the carriage. The cam controls the feed of the compound by means of a roller mounted on a piece of angle iron, and fastened to the compound. To allow the compound to be actuated while using the crossfeed, the feedscrew must be disengaged. In our case we had to remove it entirely.

B J de Bruzyn, Enschede, Holland

Accurate Use Of Compound In Work On Tapers

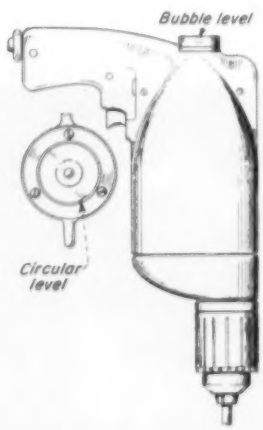
The following method of setting up for taper turners has eliminated trial and error in our shop.

The compound is set to the angle prescribed for the particular job, off the longitudinal axis, using the graduations. A dial indicator is attached to the compound, zero set on any good surface such as the tailstock quill, chuck periphery, or mounted work.

The cross-slide is withdrawn a distance equal to the sine of the angle, or some multiple thereof. The compound is then advanced the same distance as that selected for the cross-slide. This may also be done by withdrawing the compound and advancing the cross-slide. In either case, backlash must be considered.

When the angle approaches 90°, the same method may be followed, using the carriage stop with the indicator on a face.

Frank B Homan, Sayreville, N.J.



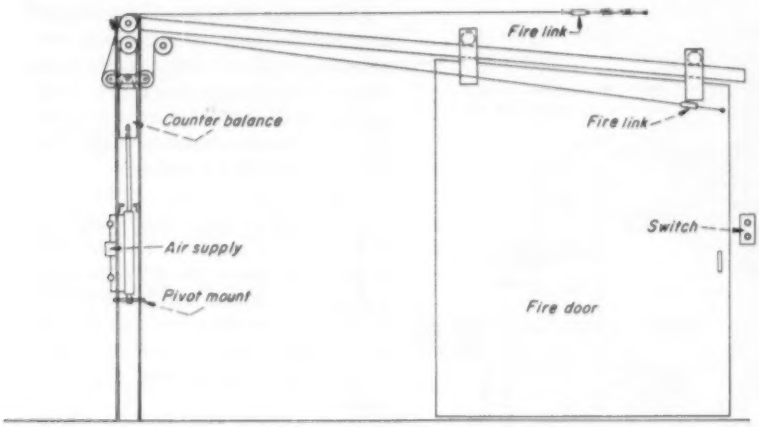
Vertical Drilling Easy With Level

Holding a portable electric or air drill perpendicular to the work is usually a little difficult. To remedy this situation we lightly machined the handle end of the housing 90° to the drill spindle. This was done to provide a landing for a small circular level.

The level is held in a mounting solidly constructed to provide the necessary protection.

A level mounted in this way makes it relatively easy to hold the drill perpendicular to the work. This will, of course, only hold true if the work first has been set up level.

Ted Hilger, Andale, Kansas



Air Pressure Operates Fire Door

We had moved to new quarters, which had a large metal-clad fire door that separated one part of the building from the rest. Fire regulations stipulated that this door must be closed at all times.

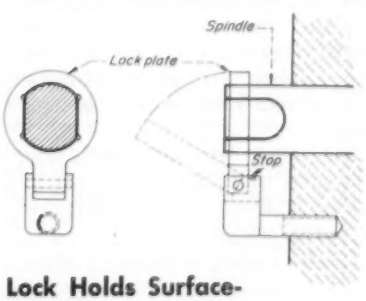
But this door was used many times during the day by workmen and truckers. It was too heavy for easy opening, and truckers would have to get off their trucks to open it, and again to close it from the other side.

A simple air-operated opening device was designed and built according to the illustration. The electrical system actuating the air valves is not complicated, and employs precision micro-limit switches. If the air is off at night or weekends the door can be operated manually as before.

Remote switches were placed in such positions that the truckers can use them when approaching the door.

The door is counterbalanced to close slowly without slamming. It requires only a small cylinder to overcome this weight and the friction of the parts. The minimum stroke of the cylinder should be 1/3 the width of the door.

Archie Wilson, Trumbull, Conn.



Lock Holds Surface-Grinder Spindle

Changing of grinding wheels on our surface grinder has been much easier lately. The illustrated lock is the big difference. It is attached to the back of the grinder to hold the spindle while removing or tightening the wheel retaining nut.

The device is made with a hinged lock plate, fitted to the rear portion of the spindle. The size and shape of the hole in the plate will vary. Some machines use two flats, others may be hexagonal or square.

The body section is machined to form a stud at one end. The other end of the rectangular shape is milled to serve as the female part of the hinge. A stop, so located that it will keep lock plate vertical in use and prevent binding, is installed across female hinge section.

The hole for mounting the lock is carefully laid out, with relation to center-to-center distance and vertical location. It is then drilled and tapped deep enough to allow the lock a good hold on the spindle. Thread depth in the hole and stud length should be coordinated to locate lock in upright position with stud jammed in bottom of hole. This will eliminate the need for any locking device to keep the stud from turning.

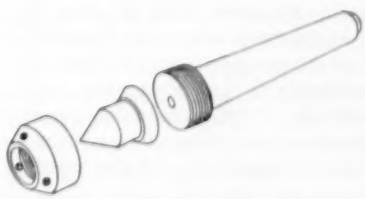
F L Rush, Columbus, Ohio

Headstock Center Is Adjustable

I am employed as an experimental machinist at a research company, and often have to hold my work within a couple of tenths on centers. This is usually no problem except when a center has to be removed and replaced with a chuck or collet. Then, when the center is replaced in the spindle, it may run a half to a tenth out of round.

This means regrinding, which calls for changing tools and resetting the compound angle, which is always time-consuming and expensive.

One way to get around this problem is to use an adjustable center, as illustrated. It has a tapered body to suit the headstock spindle of the lathe, and a locking ring—externally threaded to match the fine threads on the body. Three setscrews clamp the assembly; all parts are hardened.

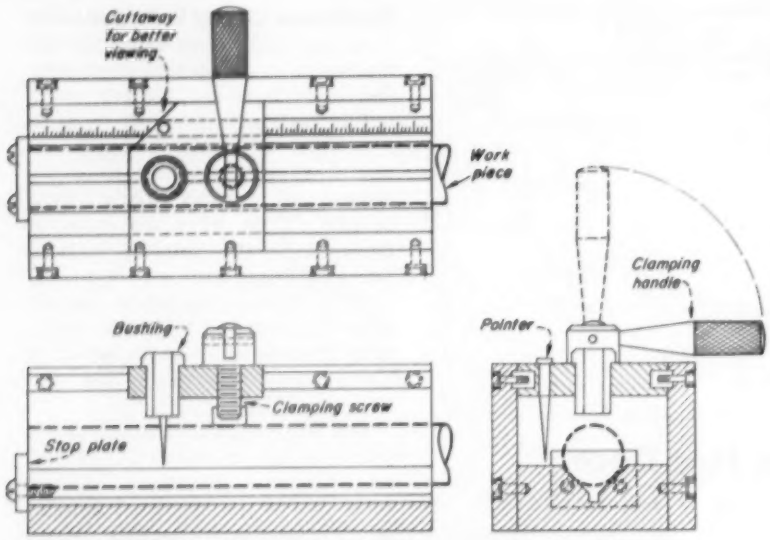


The center itself can be made to any shape: female, bull point, short, long, and so on.

When all dirt and chips have been cleaned from the headstock spindle, the center body is inserted and tapped to seat it securely. Its face is then ground square with the axis of the headstock. Finally, the locking ring with the center inside it are assembled, making sure the back face of the center snugs against the ground face on the body. In this position the center has no longitudinal motion, but may be shifted 0.02 in. in a circular direction. This allows centering the tip of the center point with a dial indicator, after which the locking ring is tightened so the center cannot move.

This center allows the usual run of turning jobs, and also lets you true up a shaft that has a run-out center hole.

Harry G Nicoll, Somerville, Mass.



Adjustable Drill Jig Speeds Work

We had a job lot of bars and tubing which had to be drilled at irregular distances from the end. At times the holes were only fractions of an inch apart, which made it impossible to use stationary drill bushings. There were also times when we couldn't know in advance where the locations of holes would be.

Because the locations of these holes were not to close tolerances, this jig served the purpose satisfactorily. To drill a hole, start by inserting the proper size bushing. Place the part to be drilled in the V-block against the stop. Then set the pointer on the scale to the required distance from the end of the work. After the clamping screw is tightened, the jig is ready for drilling.

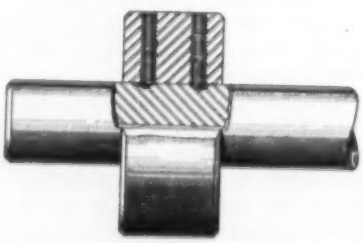
We had only one hole to drill in each piece, so there was no need for any other locking devices. However, if several holes have to be drilled in line, a similar clamping slide can be made to hold the part. It would, of course, not need the pointer and drill bushing.

Size of jig may vary with demands. We made ours 6 in. long, 3 in. wide, and 2½ in. high. The body consists of three parts; V-block and two side plates. These side plates may be extended at the bottom, if desired, to form legs. They are doweled and held to the V-block by hollow-head capscrews.

The slide, carrying the clamping screw, pointer, and drill bushing, slides on two keys inserted and screwed into the side plates. A work stop is mounted on one end of the V-groove. A 6-in. scale is fastened to one of the flat sections along the V-groove under the pointer.

If repetitious drilling is required, the bushing slide may be locked. This can be done with a small wing screw inserted through any of a series of holes drilled and tapped through one of the sides and slide key.

Fred Lugosky, Columbus, Ohio



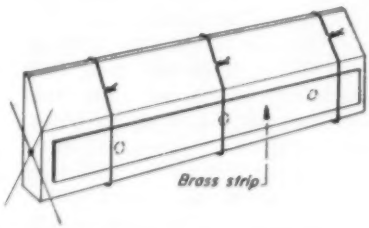
Adjustable Collar For Unthreaded Shaft

Sometimes a thrust collar with axial adjustment must be added to a shaft that cannot be threaded for such a collar. A satisfactory alternate method is illustrated.

The collar is drilled and tapped to take two cone- or cup-point setscrews, placed in line next to each other. Two indentations are spot-drilled into the shaft at a slightly greater center distance than the screw holes in the collar.

Installed on the shaft, the collar can be shifted in either direction and locked in position. To make adjustments, loosen the setscrews and tighten the screw on the side that is in the direction the collar is to move. When the desired location is found, both setscrews must be tight.

H J Gerber, Stillwater, Oklahoma



Brass Strip Checks Warping

When we heat-treated these knives for dinking dies they would warp inward, away from the beveled side. This was beyond permissible grinding limits.

We reasoned that the larger area on the outer curve chilled quicker, tending to hold the greater length. I therefore wired a 0.04-in. strip of brass to the beveled side to slow up the quench there.

The trick worked amazingly well and has held warping to within 0.005-in., a tolerable and expected amount.

J Felix Huber, Somerville, Mass

Winner No. 258

ROBERT E. KIEHL

won $25 in addition to regular payment for his idea:

TAILSTOCK TOOL FOR GROOVES

in the issue of Sept 10, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

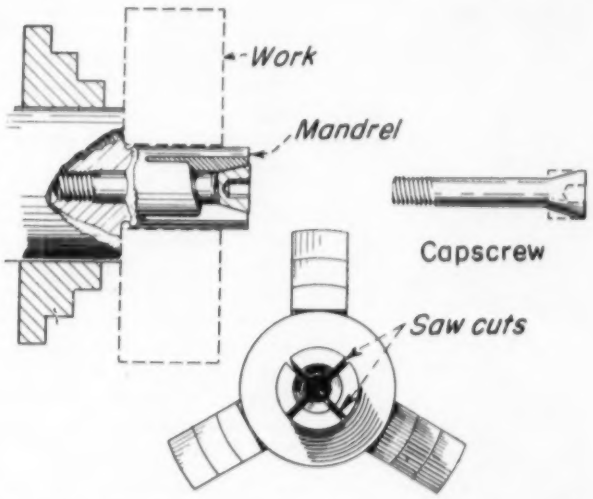
PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co. Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Expanding Mandrel Is Practical and Inexpensive In Its Simplicity

We had a number of parts, bored and faced on one side, and were confronted with the problem of holding them for finishing. It was a low-profit job, so elaborate fixtures were out of the question.

The quickly-made expanding mandrel shown has served very nicely. It holds the work firmly and can be made to suit any hole, straight or tapered.

We found the idea so applicable that we are also using it on blind-hole parts. In such cases we use a drawbar through the spindle instead of the modified socket-head capscrew.

Materials from mild steel to aluminum have been used for this mandrel, and all have worked satisfactorily.

The first step would be to get the expansion screw ready, done by turning a 12° taper on the head as shown. A piece of stock is chucked in the lathe and faced off. A tap-drill-size hole is drilled in the center a bit deeper than the over-all length of the screw. This hole is counterbored most of the depth to provide body clearance for the screw, after which it is tapped.

A 15° taper is bored to accommodate the expansion screw head. After the OD has been turned to suit the particular need, the mandrel is split. This can be done by making two neat and even cuts with a hacksaw while it is still in the lathe, saving rechucking.

R B Courtney, Whittier, Calif

Simplified Formula To Find Chamfer Height

Use of the "Simple Trig Finds Chamfer Height" fixture described by Charles Minair of France (AM-Aug 27 '56, p116) would be easier if you added a hole through the bottom of the V-block. This would allow measuring the chamfered end of the shaft with a depth micrometer or a vernier depth gage.

The dimensions would be revised as illustrated, and depth calculated as follows:

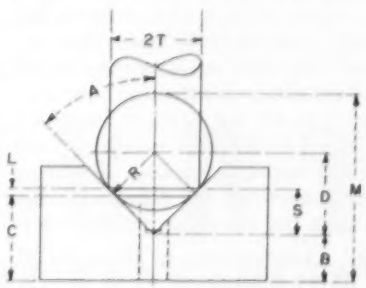
$D = R \text{ Csc. } A$

$B = M - (D + R)$

$S = T \text{ Cot } A$

$L = (B + S) - C$

Carl Johnson, Springfield, Ohio



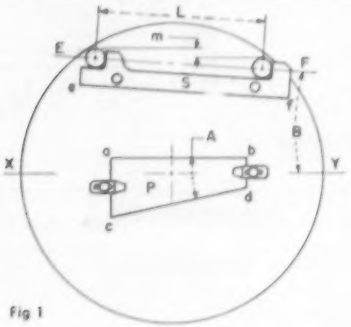


Fig 1

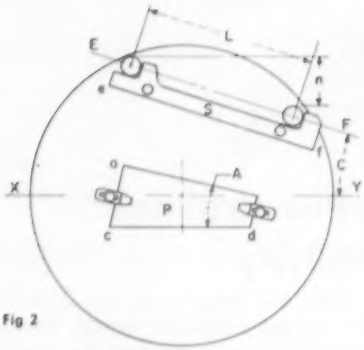


Fig 2

Measuring Exact Angular Displacement With Sine Bar And Dividing Plate

The verniers of some high-precision dividing plates will often permit reading angles to an accuracy of less than 10 sec of arc; however, the accuracy of the angular displacement of these plates is not always obtained.

The sine bar, whose numerous and interesting applications are well known, can be a valuable accessory to these plates when extremely accurate angular displacements are required.

Here's how to obtain or check the angle A, Fig 1, between the edges ab and cd of the workpiece P clamped to a dividing plate. Rotate the plate to align the edge ab parallel to a given axis xy. This can be done on the table of a measuring machine or on a perfectly flat, high-grade surface plate. Then attach the sine bar S so the axis EF of the rollers is approximately parallel to xy but without being too careful about it. Determine the angle B between the axes EF and xy by measuring the distance m between the rollers perpendicular to xy. Then the sine of B equals $\frac{m}{L}$.

The required angular displacement will be obtained when the axis EF makes a new angle C, Fig 2, equal to A+B. This is done by turning the plate to change the distance m to a new distance n equal to L X sin (A+B).

The angle of the work P will be correct if the face cd is exactly parallel to the reference axis xy.

Provided the length L of the sine bar is 8 in. ±0.0004, and the distances n and m can be obtained on a measuring machine to within ±0.0004 in., the original angle B will be accurate within ±1 sec. However, the difference between the sines of two angles becomes smaller as the angles become larger, so the total maximum error will be ±2 sec for an angle C of 10° ±2.5 sec for C = 30°; and ±3 sec for C = 45°.

Errors will be reduced to a minimum by keeping m close to zero or, if possible, by placing the edge ef of the sine bar directly on the edge of the workpiece.

If m is larger than zero, the sine bar may be tilted either right or left. If to the right, as in Fig 1, add angle B to angle A; if to the left, subtract B from A.

If the measurements of m and n are taken with gage blocks and a dial indicator on a surface plate, there should be a maximum error of ±0.0008 in. This means that measurements made in this way have about twice the error of those made on a measuring machine, that is, ±4 sec for C = 10°, ±5 sec for C = 30°, and ±6 sec for C = 45°.

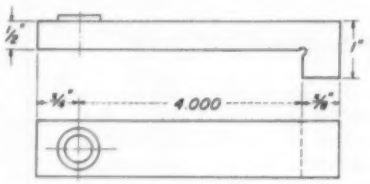
Ch Minaire, St Etienne, France

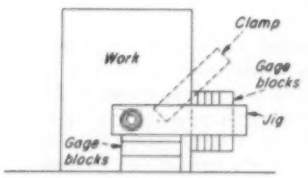
Accurate Drilling Possible With Auxiliary Jig

We are using this jig extensively in our shop when holes must be accurately drilled in relation to each other. It is a time saver because there is no need to set up the work on a milling machine or jig borer.

It is simple in design and easy to manufacture. We started out with a 5⅜-in. long piece of tool steel, sufficiently wide to allow for corrective grinding to place the bushing in exact center.

The block must be squared, after which it is laid out to a standard size between center of bushing hole and inside face of bed. We made this distance 4 in. because our requirements never go beyond that. The hole is drilled and reamed to suit standard drill bushings. The heel is formed by either





bandsawing or milling after a small hole has been drilled to produce a relief for the heel to clear edges of workpiece.

If hardening is desired, it should be done before final grinding. The distance between the heel face and the center of the bushing is made by grinding back until that dimension is reached, checking often to avoid grinding too far.

Location of holes in the work is found by setting the jig with gage blocks. The illustration shows how this is done on a surface plate. After the first hole has been drilled, gage blocks are either added to, or subtracted from, each face to bring the bushing into the next position.

C Heaven, Greenford, Middlesex, Eng.

Continuous Type Broaching Machine Built in Five Sizes

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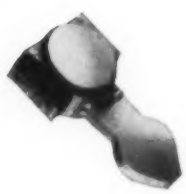

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■ Surface Broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations.

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With semi-automatic loading this is reduced to just 3 operations.

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Results are:

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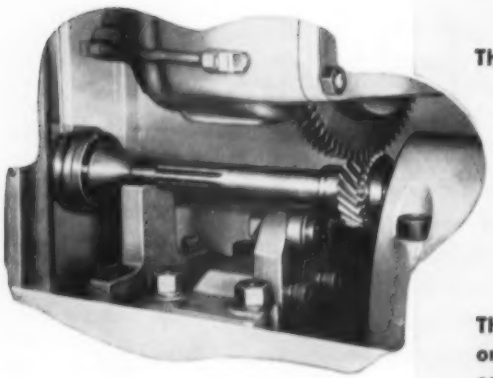
The approximate work locater and head and tailstock centers or plugs are the only work part changes that are additional to a conventional gear shaver.

Red Ring Shaving Machines, Models GCU and GCI may be equipped with this equipment.



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WORM-EFFICIENCY CHARTS . . I

OLIVER SAARI, development engineer, ILLINOIS TOOL WORKS, CHICAGO

Two charts provide quick solution of the formulas necessary when finding the efficiency of a worm. The chart on this page solves the tangent of the lead angle λ, and this value is again used in solving for the efficiency E of the worm, page 165.

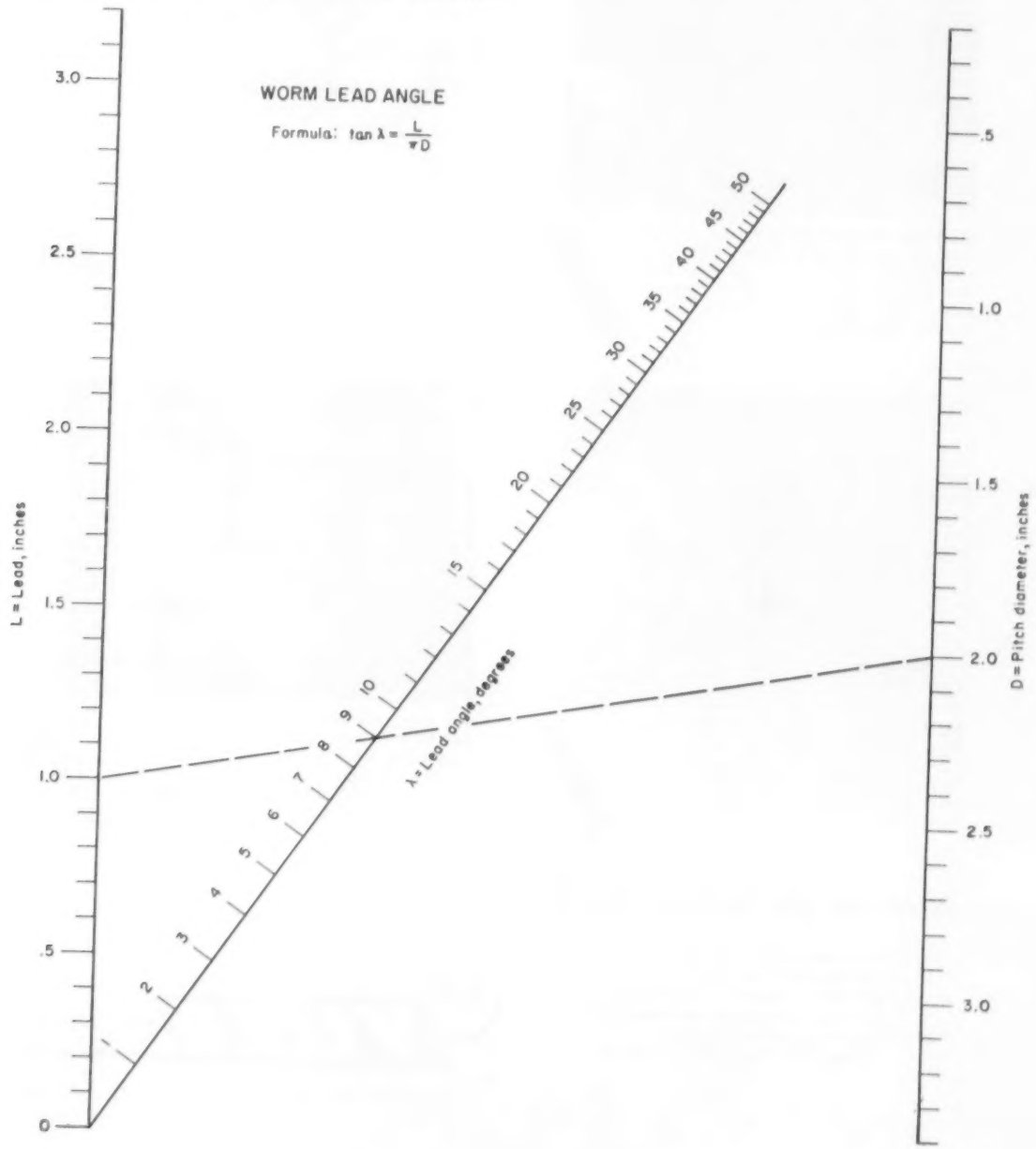
Example: worm pitch diameter $D = 2$ in.; worm lead $L = 1$ in. and the coefficient of friction $\mu = 0.06$.

Solution: tan λ from chart (below) $= 1/2\pi = 0.1592$

Then $\lambda = 9° 3'$, and cot $\lambda = 6.278$. By calculation:

$$E = \frac{1 - 0.06 \times 0.1592}{1 + 0.06 \times 6.278} = 71.9\%$$

The chart on page 165 solves the equation directly, knowing the value of μ and tan λ and cot λ.



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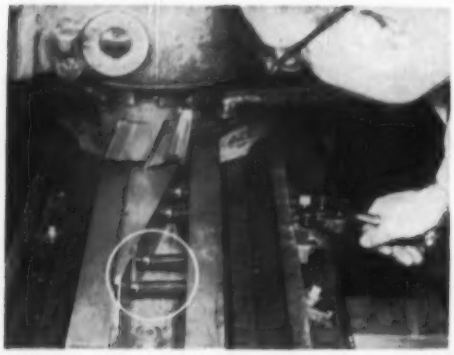
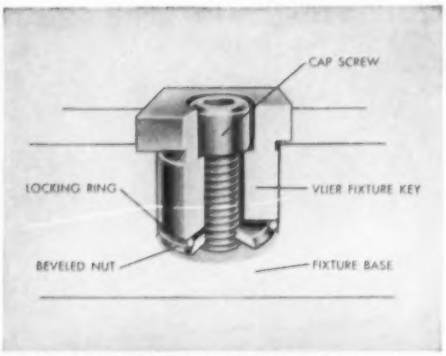
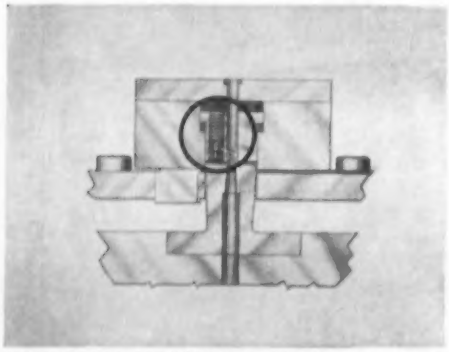
Thousands of companies are making drastic savings by using standard Vlier Tooling Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.



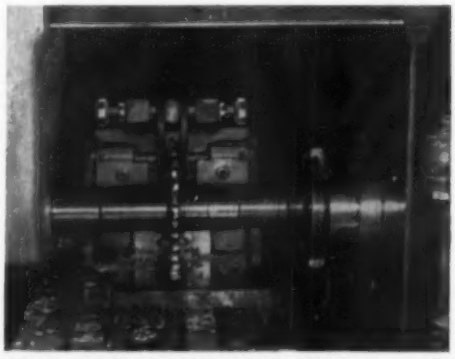
CLAMPING OFF-ANGLE PARTS in jigs and fixtures is a cinch with Vlier Swivel-Pad Clamps. Pad swivels on a ball, 7½° each side of center line. Can't bind or damage part surface. Socket set models can be inserted from either end.



NEW FIXTURE KEY WITH INSTANT-ACTING, INTEGRAL LOCK eliminates unnecessary drilling and tapping operations to mount keys in fixture base. Holds key securely, permits quick change of key size for different table slots. Insures perfect alignment of jigs and fixtures on table.



NEED ACCURATE, UNIFORM SPRING LOADS? Vlier Spring Plungers really pay off when positioning parts in jigs and fixtures. Spring loads are accurately set at the factory; stay constant. Plunger telescopes completely.



THE RIGHT AMOUNT OF CLAMPING PRESSURE AND NO MORE! There's no distortion of the part when Vlier Torque Thumb Screws are used to clamp it in the jig or fixture. Once predetermined end pressure is reached, the head turns freely. Working parts are protected from foreign matter.

Where can your tool room save?

Chances are, you can think of dozens of uses for standard Vlier Tooling Specialties — applications where expensive, complicated, home-made devices are now being used. *Why not write for your copy of the new 1956 Vlier catalog today?*

Originators of small parts that make a big difference in tooling costs!

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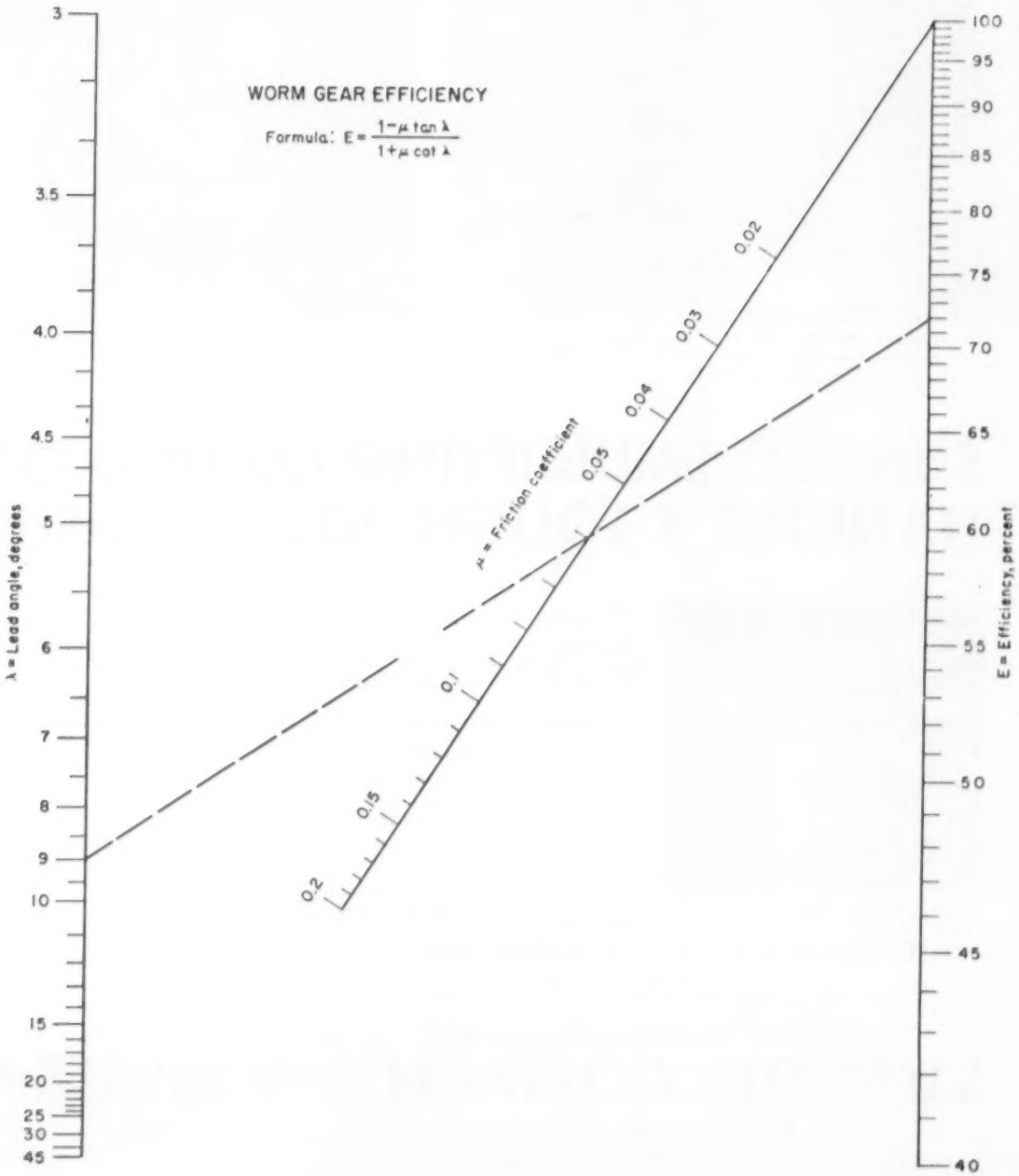
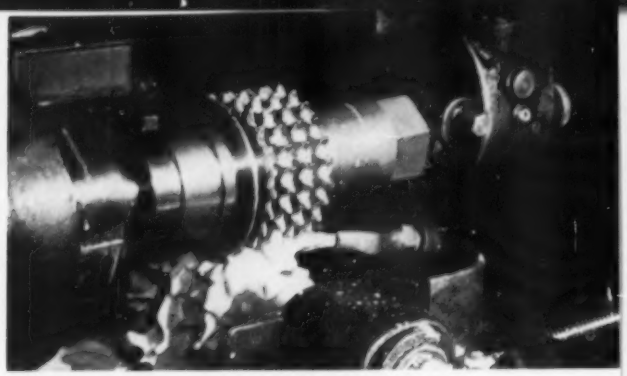
WORM-EFFICIENCY CHARTS . . II



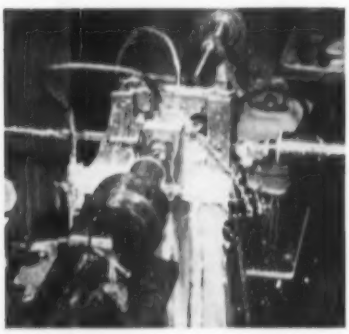
TURNING AND DRILLING. During the machining of a 9-in. piece using carbide-tipped tools, S.E.C.O. removes heat fast ...assures long runs, top speeds.



HOBBING. Flooding the cutting edges of a high-speed-steel hob working 1117 steel, S.E.C.O. provides lubricity and cooling power needed for long tool life.

CENTERLESS GRINDING. In grinding 4320 H steel pins, S.E.C.O. keeps wheels clean. Grinding dirt drops out quickly...is not recirculated. Parts are rust-protected.

SUNOCO EMULSIFYING CUTTING OIL HANDLES 4 TOUGH JOBS...EASILY



DRILLING AND REAMING. On steel forgings with a 350/400 Brinell, S.E.C.O. keeps drills cool...gives clean cutting.

Whether you are shaping, hobbing, grinding, reaming, boring or milling, it will pay you to look into the advantages of SUNOCO EMULSIFYING CUTTING OIL.

Moderately priced, S.E.C.O. has been industry's most widely used soluble cutting oil for years. Higher-than-ever machining efficiency, increased detergency, easier mixing, and other added advantages are helping keep S.E.C.O. the leading emulsifying cutting oil in the country today.

For complete information about S.E.C.O. see your Sun representative. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-11.

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American Machinist

REFERENCE BOOK SHEET

ABRASIVES FOR BLAST CLEANING

Source: "SAE Manual on Blast Cleaning" published by the Society of Automotive Engineers, 485 Lexington Avenue, New York 17

The abrasives used in blast cleaning may be classified as vegetable, mineral, or metallic, according to their composition.

Vegetable abrasives include such items as wheat grains, corn-cobs, crushed nut hulls such as walnut or hickory, rice hulls, fruit pits, and so forth. These materials are often referred to as "soft grit" and are used in special-purpose cleaning and deburring, where the surface cannot be marred. Examples of such applications are the cleaning of aircraft, automobile and diesel pistons, electric motor armatures, and pump impellers. Air is universally used as the propelling medium.

Mineral abrasives are natural and synthetic.

Natural abrasives consist of sand, crushed rock, garnet, pumice, and emery. Approximately 500,000 tons of blast sand and 100,000 tons of ground rock and sandstone are used annually in the United States. The use of garnet, pumice, and emery for blast cleaning is very limited.

Blast sand and ground rock products are usually available as shown in the table.

Sands are largely used for outside blasting where the material is dissipated in one pass through the blasting machine.

Synthetic mineral abrasives, such as silicon carbide and aluminum oxide, have superior resistance to breakdown compared with sand, but their use is relatively limited, due to higher cost and relatively short life compared with metallic shot.

Metallic abrasives may also be subdivided into two categories, ferrous and nonferrous. The latter includes such materials as copper and aluminum, but the amount produced and used is extremely limited. They are used on nonferrous parts where ferrous shot might cause a contamination problem or where the color caused by ferrous shot is objectionable.

Ferrous shot is available in three types: cast iron, cast steel, and cut wire.

The cast-iron shot and grit are made from cupola-melted iron containing about 3.5% carbon and 1.5% silicon. To reduce the hardness (Rockwell C63) and increase the resistance to fracture in use, this shot may be heat-treated to produce hardnesses of Rockwell C20 to 57, depending on the producer and use.

Steel shot may be either cast balls, or balls forged from wire, or short cylinders cut from wire.

Cast-steel shot is atomized into random sizes from plain carbon and alloy steels of varying carbon content. It is screened and then heat-treated to various hardnesses, ranging from Rockwell C20-60, depending on the producer and use. These shot are usually not as hard as the unheat-treated white cast-iron shot, but generally have a much greater resistance to fracture in use.

Cut steel wire of different hardnesses and various compositions is available in cylinders (length approximately that of diameter), which wear to a spherical shape with use. This material may be obtained prerounded, also, if desired.

Wrought steel shot—steel wire of different carbon contents—may be forged into spheres, as in ball-bearing manufacturing, and heat-treated. This product is uniform in shape and dimensions, but is of limited use, due to its high cost.

Approximate Sieve Analysis of Blast Sand, Per Cent

Retained on:	Grade 1	Grade 2	Grade 3	Grade 4	Grade 7	Grade 7 Special	Grade 10
No. 8 Sq Mesh	0.0	0.0	0.0	0.0	1.0	1.0	8.0
No. 10 Sq Mesh	0.0	0.0	0.0	0.0	10.0	12.5	40.0
No. 14 Sq Mesh	0.0	0.0	25.0	36.0	45.0	47.0	37.0
No. 20 Sq Mesh	0.0	5.0	49.0	51.0	32.0	36.0	12.0
No. 30 Sq Mesh	1.5	43.0	23.0	11.0	10.0	3.5	1.5
No. 50 Sq Mesh	78.5	48.0	3.0	2.0	2.0	0.0	1.5
Passing:							
No. 50 Sq Mesh	20.0	4.0	0.0	0.0	0.0	0.0	0.0

PRINCIPAL USES

Grade No. 1 —Blasting soft metal castings, such as aluminum, aircraft, and where a "satin" finish is desired.
Grade No. 2 —Blasting soft metal castings, for pointing, aircraft, etc.
Grade No. 3 —Blasting castings, for enameling, lettering marble, etc.
Grade No. 4 —Blasting for metallizing.
Grade No. 7 —Blasting for metallizing, general cleaning of scale, castings, etc.
Grade No. 7 Special —Blasting for metallizing, general cleaning of scale, castings, etc.
Grade No. 10—Heavy blasting, such as removing paint from tank cars, etc., and where air pressure is 110 psi or more.

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44 years of cutting tool experience are behind him . . . ready to serve your needs.

Broach design can make or break a broaching operation! Your Illinois Tool Works sales engineer has the experience and engineering skill to help you determine the proper approach to broaching problems . . . to aid you in planning broach specifications, broach design. Illinois Tool Works has been a leader for almost half a century in the design and production of metal cutting equipment for almost every metal cutting application. Talk to your Illinois Tool Works man about economies that you might gain through the performance of superior broaches.

Look to your Illinite Distributor for the most complete line of standard end mills, standard milling cutters and special cutters.

ILLINOIS

TOOL WORKS

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Chicago 39, Illinois

Talking Shop . . .

FEA?

A CLIPPING FROM the Los Angeles *Times* reports the formation of a club in the Southland high school of the Future Engineers of America. Drawing a bead on the path pioneered by the Future Farmers of America, the founders of the new group (science and math teachers) seek the help of industry in spreading the clubs through all of Southern California. If the organization takes there it may well spread across the country. From the dour reports of the decline in science and math courses in our high schools, we can only hope that there are enough teachers left to establish this beachhead in the juke-box set. In sending us news of the FEA, a reader says he can top this idea with one of greater potential: An organization to fill the ranks of expert machinists and toolmakers. We second the motion!

Piecework Gimmick

TOP-RATE MACHINISTS are employed by New Process Gear, Syracuse, to run standard semi-automatic machines. But the gimmick is that one man will operate as many as five machines in a group, performing all operations needed to complete the part: for example, rough, semi-finish, and finish turn, drill four holes, drill and ream two holes. Operators make their own tool changes, a fixed allowance being made for this in the piecework rates. Only when tool change becomes excessive, trouble develops, or a new setup has to be made, is the setup man called in. When this happens, the operator automatically goes on lost-time rate.

Magnesium Fires

A FRIEND in the magnesium business calls up and cries on our shoulder whenever there are newspaper reports of a spectacular magnesium fire. About 90% of them turn out to be false. The "burning magnesium plant" widely reported during last year's floods was found to be several miles from the scene of the fire. The "magnesium racer" turned out to be burning oil. And so forth. But there remains the fact that sometimes and under some conditions, magnesium burns. When it does, putting the fire out can be a difficult problem. A study of extinguishing methods made for Wright Air Development Center is available from Office of Technical Services, Dept. of Commerce, Washington 25, D.C. Ask for PB 121375, "A Study of Magnesium Fire Extinguishing Agents," and send $3.75. The most effective agent is reported to be chlorobromomethane combined with a 50% solution of di-isodecyl phthalate or ethanol.

Tough Plate

PLATED COATINGS are traditionally brittle and tend to pull away from the parent metal if it is bent or twisted too far. Perhaps you hadn't realized that, like many traditions, this one is not always justified by the facts. Yankee Metal Products is making rear view mirrors for autos by stamping them out of brass sheets, buffing, and bright nickel plating with Hanson-Van Winkle-Munning's Nickel-Lume solution with a rocker-arm cathode agitation. The glass mirror is then gasketed into place and the plated frame is drawn over the edge of the glass. Yankee Metal Products is thus able to use a heavier nickel plate (hurrah!) without danger of cracking.

Surface Damage

A NEW METHOD for measuring the depth of the disturbed layer of an abraded surface has been developed by Bell Labs in work on germanium. Based on the "photomagnetoelectric effect," the studies have shown that sandblasting or lapping with coarse abrasives leaves a damaged layer as much as 35 microns thick, while polishing with fine abrasives disturbs a layer 1 to 2 microns thick. Brief immersion in an ultrasonically agitated water suspension of 600 mesh abrasive appears to extend to a depth of about 1 micron.

If, like us, you are curious about the "photomagnetoelectric effect," here is how Bell Labs explains it: When the front surface of a piece of germanium is illuminated by light that is highly absorbed at the surface, excess pairs of oppositely charged carriers are produced. If a magnetic field is applied parallel to the surface it causes the particles to curve in opposite directions instead of going straight through the piece. This creates a measurable voltage difference between two electrodes on the back surface. A damaged front surface reduces this voltage difference because the excess carriers recombine more rapidly.

Automation's Waterloo

SPECIAL MACHINERY BUILDERS are proud of the variety of problems they have solved, but they came a cropper on a recent request from Hiram Walker. Planning a counter-attack on the decanter-under-every Christmas-tree distillers with a bottle wrapped in foil and tied with a bow, Walker ordered 8000 miles of ribbon from Minnesota Mining and Mfg. They found a machine to wrap the bottles in foil, but no special machine builder could devise a bow-tier. Since mid-summer, therefore, a corps of women has been busy in the Walkerville, Ontario, plant tying pretty bows by hand. If, like us, you have ever tried your hand at tying one of these forty-two loop bows on the gift for your wife, you can readily understand why this is one field the machine builders seem fated to leave to the ladies.

What die-design training needs

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND, IND

Design of metal-stamping dies has become one of the largest and most specialized activities in manufacturing engineering. In other fields, orderly evolution and growth have been aided by the combined efforts of industry and university, but the field of die design has been developed almost entirely by the efforts of shop men.

It can be said that the rules, methods and procedures in die design have thus evolved in a somewhat disorganized fashion. What we know has come from the published and word-of-mouth efforts of practical men, mostly working by trial and error, plus some research by their employers.

The published work on die-design practices and principles logically appears first in the business papers, and is later compiled into books by editors. By the time these compilations appear, the industry has advanced to such an extent that much of the material is obsolete. Other books by independent authors may reflect experiences in a few companies at best, and therefore cover dies for a narrow range of stampings.

To the person seeking knowledge of up-to-date methods, the problem resolves itself to wading through a mass of literature and trying to decide which method or rule to follow from the many discussed or illustrated.

None of the existing books can be used as texts for training courses, because the material is obsolete, incomplete, or numerous and even conflicting methods are suggested to accomplish the same thing. Further, the standards and conventions used on die drawings by different companies vary so much that schools can't be sure exactly what to teach. Either their graduates will be confused when they enter industry or will have to "unlearn" a considerable part of what they have been taught. To be specific—examination of various companies' drawings and books reveals: 14 different conventions to indicate a simple screw on a tool drawing, 11 ways to show a die spring and 22 methods for finding the diameter of a blank for a drawn shell. These are only three matters out of hundreds that should be standardized before textbooks are written.

A die designer can cost his employers $100,000 by the mistakes he makes during his career. Yet most companies do nothing about formal training of such men and little to encourage it elsewhere, despite the shortage of qualified personnel. To replace the "sink or swim" method of developing effective die designers, Mr. Cope offers a program that would lead to sound training and do away with the present confusion in choice of methods. His ideas are based on his experience since 1935 in educating 2500 die designers and his observations during consultation work with many metal stampers.

Mr. Cope received the 1956 Presteel Award of the metal-stamping industry, because he "has probably done as much as any other individual to establish high technical standards for the stamping industry."

Little effort by colleges

Something more effective than heretofore must be done so that schools can offer courses that will save the employer the expense of retraining graduates to his methods. No one seems to know why the colleges have not exercised leadership in the development of this important field. Only in recent years have our institutions of higher learning begun to see the light. A few, prodded by technical societies and trade associations, have added die-engineering courses. These are steps in the right direction, but much more work must be done to develop really effective courses before industry can derive any real benefit.

The fact is: the metal-stamping industry is facing the greatest shortage of die designers and engineers in its history! It is a wonder that no one has done anything about the need for training the hundreds of men being sought everywhere today. Only a small handful of schools saw the handwriting on the wall. Most of these schools were doomed to early failure. Without proved curricula, good textbooks and a reasonable semblance of standardization of methods, an instructor with wide practical experience could have little clue as to what should be taught.

Of the die-design schools able to hang on, only two or three have grown to any size. They were able to write their own private texts. Those without access to texts have remained small, because the quality of their graduates, and hence their own success, must depend upon the capabilities of the instructors that they are able to hire. Good instructors are difficult to get or hold if the school's management can supply only a curriculum sheet and a few die drawings from industrial sources.

The inability of formal training programs to cope with the need for die designers and die engineers is revealed by figures on 1955 graduates.* These totalled 526 from all sources and included men who took either the die-design or the tool-design options. Of this total, 426 men were trained by proprietary schools and only 40 had been affiliated with the extension divisions of colleges and universities. How many of these men were actually tool designers nobody knows.

Poor training by industry

Because of the limited help that these schools and colleges can give, industry has had to train its own men. What are the results? Most do no training. Some have training programs that do little more than expose an apprentice to the rudiments. The few that have well-planned courses consider their own interests first and those of the student second. Their courses are planned around their particular needs and products. After serving a long apprenticeship under these conditions, the die designer has no knowledge of many types of dies. He has the choice of remaining with his employer as a specialist or going elsewhere to secure wider knowledge. Most men choose the latter, at great loss to the companies that trained them, because the desire to learn is strong in the kind of men who enter the die-engineering field. In fact, among reasons for quits, leaving to gain more experience ranks second to the lure of higher wages.

A number of companies have become alarmed by the growing shortage of designers and have done something about it by enrolling employees in the few institutions that offer evening or correspondence courses in die designing. Other firms are setting up in-plant training programs based on these courses. But on the whole, managements seem content to vie for one another's men by costly and continuous advertising programs in newspapers. Such appeals only raise wages and increase the migration of designers.

The answer lies in standardization of the principles and methods used in designing dies and the adoption of standard conventions for die drawings. When these objectives are achieved industry will get better men, and they will be less prone to make costly mistakes. Because most die designers have had no formal training, and have had to learn by the "sink or swim" method, it is estimated that during his career the average die designer costs his employer $100,000 in mistakes alone. All of these mistakes are not readily apparent, like incorrect dimensions on drawings or laying out a die for a left-hand part when a right-hand part is wanted. Mistakes that are less easy to detect are in the form of wasted materials, dies that do not operate efficiently, unsafe dies that lead to costly accidents, and extra dies and operations that could be avoided.

Emphasis as to the need for standardization of principles, methods and conventions as the prelude to better formal training programs comes from the experience of my own institution. It has been found that industry must be "trained" as well as the student, particularly if the latter is to be readily accepted. Little trouble has been experienced with companies that have adopted Acme standards and none at all where a graduate heads the die-engineering department. But "forcing" standards on an industry by sheer number of men trained in a certain way is a slow and painful task. It is tantamount to putting the cart before the horse.

The proper way to attack this training problem is to set up a national committee sponsored by industry and schools. The work of this committee should not consist of seeing how many die drawings can be collected, because this is an endless task and can lead to even greater confusion. Instead, the committee should break down each type of operation by definite principles, make a drawing of each principle, write a full explanation of its uses, advantages and limitations.

822 basic principles

This work would not be as difficult as it appears at first glance. In our courses, for example, we recognize nine successful principles for performing inside curling operations, depending on the size of the curl and shape of the part. Only nine drawings would be needed to show these principles in detail, and forever stop the attempts made every day to use other principles that have been tried countless times and have resulted in failure. The same could be done for the other 43 types of operations. In all, I estimate there are 822 basic principles used in making metal stampings. Thus, fewer than 1000 drawings would be needed.

This work would not be as difficult as it would seem for a properly set up committee. Collation of the rules, principles and formulas can be done, because it is possible to find somewhere the men who from experience know the answer to almost any specific problem that can arise in the making of metal stampings. Standardization of die-drawing conventions may be more difficult to achieve, and will at least consume time. However, if the material that I envisage is properly gathered and edited, we will have a package that will provide the basis for universally accepted training programs and practice.

Not until this program is accomplished will we achieve adequately trained die designers *throughout* the die and stamping industry.

*1955-1956 *Survey of 71 Technical Institutes*, Technical Education News, Sept '56.

Predict $1 Billion-a-Year Machine

CHICAGO—The machine tool industry has tripled its annual volume of shipments since 1950, from $305 million to $860 million.

Its output, evidence of the nation's industrial growth, has been expanding twice as fast as the record climb in Gross National Product.

Its volume of business, measured in new orders and shipments, should be $1 billion a year on the average in the foreseeable future.

These optimistic facts and estimate of future volume were put before the members of the National Machine Tool Builders Association by their president, Louis Polk, who also is president of Sheffield Corp, at NMTBA's 55th Annual Meeting, held at the Edgewater Beach Hotel November 7, 8 and 9.

Pacesetter Industry

Mr Polk cited the growth of the metalworking industries, which have doubled their physical volume of production the past 10 years, and which promise to expand another 20% by 1960 and still another 20% by 1965. He said that metal products "will only be produced by and flow from machine tools," and that "any real production progress must be primarily created and sustained by machine tools."

The nation's economy should achieve new patterns of growth and the machine tool industry must pace this growth on an accelerating pattern, Mr Polk declared. Only bar to this achievement would be unexpected disaster or mismanagement of our economic and political life. With this pattern in mind, the machine tool industry must be prepared to invest in new equipment and must not allow its capabilities for precision and output to deteriorate.

"It is clearly in the enlightened self-interest of the financial community, the private investor and the investing public to encourage our industry's growth with adequate new capital resources," Mr Polk said. "For our growth is a catalyst of profits in all industry. Through its ability to provide constantly increased productivity, our industry has served as the mainspring of our nation's basic growth and progress."

Facilities Lease Contracts to End

Department of Commerce policy is to terminate facilities lease contracts as soon as possible and thereby get government out of competition with private industry, J Robert Jones, Director Metalworking Equipment Division BDSA,told members. GSA, in fact, has told contractors with government machine tools that leases will not be extended beyond termination date (22 in 1956, 57 in 1957, 9 in 1958). As a result, many contractors have purchased or intend to buy leased tools.

Changed material requirements for aircraft and other mobilization items and their impact upon the machine tool industry have been discussed by BDSA with aircraft companies and the Aircraft Industries Association, Mr Jones reported.

BDSA soon will be in touch with builders and users of elephant tools to secure information about numbers, age, condition and the mobilization needs for such tools, he asserted. This information, plus Defense Department requirements, will be the basis for BDSA's recommendations early in 1957 for a long lead-time machine tool program.

More and more machine tool builders have been adopting the new accelerated depreciation methods provided for in the 1954 Internal Revenue Code, Graham Marx, chairman NMTBA government relations committee and vice president and general manager G A Gray Co, reported. This fact was revealed by a survey of depreciation methods and practices among association members.

There is great disparity among companies, however, with many writing off the cost of facilities and getting their investment behind them two and three times as fast as other

NMTBA's Newly Elected Officers and

PRESIDENT
Jerome A Raterman
Monarch Machine Tool Co
Sidney, Ohio

FIRST VICE PRESIDENT
Alfred V Bodine
The Bodine Corp
Bridgeport, Conn

SECOND VICE PRESIDENT
Ralph J Kraut
Giddings & Lewis Machine Tool Co
Fond du Lac, Wis

Tool Market as Sales Pace US Industry

Retiring and New Executive VP's

RETIRING
Tell Berna

NEWLY APPOINTED
Ludlow King

companies. The survey showed that the average depreciable life used for machine tools by builders is somewhat lower than the average set out in Bulletin F. It also supports the position that depreciable lives for machine tools in Bulletin F should not be extended if Bulletin F is continued.

Mr Marx pointed out that the price differential between US and foreign-built machines continues to widen. On the other hand, the quality, performance, features and availability of such foreign-built machine tools compared with American tools, has narrowed. High American prices for big machines have encouraged Europeans to enter the market. Automation-type machines are being made in increasing numbers in foreign builders' plants.

TELL BERNA HONORED

Special tribute was paid Tell Berna, executive vice president, who will retire shortly after 20 years of service with the National Machine Tool Builders' Association. He was presented with a silver tray, around the margin of which were the engraved facsimile signatures of present members of the NMTBA Board and all of the past presidents over the last 20 years. Louis Polk, NMTBA president, said of Mr Berna, "We owe him a debt of gratitude. He has helped to formulate the policies and guide the thinking of our industry. He truly merits his reputation for high ideals and breadth of vision."

The West German combine of VDF, three compaines making engine lathes, sold and shipped 2400 lathes in 1955, whereas 12 major US lathe builders sold 1816 units and shipped 1497. These figures do not include those of 142 other lathe builders in West Germany.

Speaking for his committee, Mr Marx expressed the belief that modification of the positive list of machine tools that should be denied export to Iron Curtain destinations, and policing of this policy, is strictly a government function. General discouragement of trade with Russia and her satellites must of necessity be a policy stemming from the State and Defense Departments.

New Replacement Directive

The replacement-of-machine-tools directive issued by the Defense Department on September 21, which requires each service branch to include an annual request of 2% to 8% of the acquisition cost of its machine tools for replacement buying, "is a milestone accomplishment for which the government is to be warmly applauded." Mr Marx emphasized that the directive will be worthless, however, unless it is properly policed and followed through in an atmosphere of real urgency.

Directors

SECRETARY AND DIRECTOR
Walter K Bailey
Warner & Swasey Co
Cleveland, Ohio

DIRECTOR
Edwin R Smith
Seneca Falls Machine Co
Seneca Falls, N Y

"BUILDING BLOCK" CONCEPT: Tool Builders' Way to Stay Ahead of Automation?

CHICAGO—Building block machine tools are the answer to the rapid growth of automatic production lines, Delmar S Harder, executive vice president Basic Manufacturing Divisions, Ford Motor Co, told members of the National Machine Tool Builders' Association November 9. Use of the building-block concept will allow stockpiling of major machine units and components, will permit incorporation of technological advancements, will facilitate rapid incorporation of product changes, and will not result in frozen designs.

(First publication anywhere of Ford's building-block machine tool idea was in the July 16, 1956, issue of AMERICAN MACHINIST).

Mr Harder believes that the building-block concept is an important factor in extending the automatic production line into new areas and is a real challenge to machine tool builders. Ford has taken up this concept because its main objective is to gain the maximum degree of flexibility in design of in-line transfer machines and of other high-production tools in order to make car-model changes less costly. Unitized equipment may cost more, Mr Harder conceded, but the extra flexibility would be worth the added investment. He remarked that some machine tool builders have already shown keen interest in Ford's ideas.

Use of automation in assembly operations is due for a sharp increase, Mr Harder predicted. Whereas most automatic assembly has been confined to small assemblies and subassemblies, it will be extended before long to large and complex components. The risk involved has been the chief deterrent up to now—management cannot create a manual assembly line quickly if the automatic unit breaks down. But Mr Harder suggested that means might be worked out to bypass a broken-down station through quick substitution of a station with perhaps four to six manual operations.

Preventive maintenance has become of paramount importance in automatic production systems, Mr Harder said. It is necessary to maintain production, not machines. He advised that teams of preventive maintenance men be set up to cover only a specific area, the result being a quicker follow-up on breakdowns so that the operator is less inclined to tinker.

Mr Harder advocated use of automatic gaging to detect variations in the production process and to combat them successfully with timely adjustments or tool replacements. Less downtime and higher quality of product result. Combination of automatic gaging and feedback mechanism create advantages that not only detect any trend to off-specification parts, but also correct tool setting proportionately.

Five Basic Factors

Machine tool builders, Mr Harder suggested, should consider these factors:

- Better programming of production to be able better to meet deliveries. Delays have seriously distorted Ford's planning and increased its manufacturing costs.
- Motors, clutches and drives on machines should be arranged for rapid removal for replacement. Air valves and gages should be manifold-mounted.
- A good practical overload device should be provided to stop a press or disengage the ram at any point of the stroke where overload may occur. Such a device would prevent breakage of press components and dies from overloads.
- Greater flexibility of machine design is needed. Use of existing Joint Industry Conference standards should be expanded and new standards developed. Example: Standard components for stamping machinery such as multiple crowns, rams, columns and beds could be tied together and operated as one unit. This kind of design would make it possible to add or delete standard units commensurate with the number of operations required to produce the given stampings as well as the smaller parts.
- Considerable thought should be given to building in-line transfer machines for handling steel parts. Such machinery would be more rugged (with larger bearings) and generally better built than the machines now used on cast iron.

Mr Harder said that machine tool builders have done an excellent job in advancing automatic production techniques. Cars of 1957 design could not be sold at anywhere near today's prices if builders had not improved their machines as they have. He advocated users working more closely with machine builders, saying that "we in the auto industry can help by seeing to it that our manufacturing engineers call in machine tool engineers as soon as parts are designed. Thus we could get their ideas for machine tools which will process parts at the lowest cost."

Ford's practice is to perform a quality capability study on new machinery on the builder's floor, prior to approval for shipment, Mr Harder revealed. This study is based on detailed inspection of consecutive pieces manufactured in the production trial run. Both the builder and Ford benefit, because any problems arising can best be remedied at the builder's plant.

Automation Cuts Accidents

Automated operations have been responsible for a reduction in accident rates, both frequency and severity, that has been "nothing short of amazing." In years gone by, an increased accident rate went hand in hand with increased production. Automation also has called for a general upgrading of skills in Ford's work force, Mr Harder declared. Future planning provides for an even larger percentage of employees being prepared to perform technical and skilled jobs.

Productivity is the best means of lowering production costs to meet challenge of competitors, to satisfy the growing demands of the consumer, to beat inflation and to provide the nation with adequate defensive power, Mr Harder concluded. The key to greater productivity is better machinery and equipment. "That makes you people (machine tool builders) just about the most important people in this country today."

Abrasive-Belt Grinding Steals Limelight At Second National Metalfinishing Show

CLEVELAND—Emphasis was definitely on abrasive-belt grinding as the Behr-Manning-Co-sponsored National Metalfinishing Show displayed the products of some 34 manufacturers here the last week in October. More than 100 metalfinishing machines of all types and sizes, ranging from small hand sanders to heavy sheet-polishing units attracted upwards of 3000 production men. Included were representatives of several West Coast airframe makers, a team of abrasive technicians from a major automaker, and two railroad cars of customers of a Rochester, N Y, distributor.

The spotlighted abrasive-belt grinding machines ranged from a small bench model for light manufacturing to high-production units capable of removing impressive amounts of stock. Several manufacturers demonstrated centerless belt grinders and polishers, and several twin-belt machines shown were for continuous grinding of both ends of springs and similar parts, or for both sides of wrenches, pliers and other parts that can be fixtured in a rotating work carrier.

Portable air and electric sanders were much in evidence. New in this field were a fast-cutting orbital sander for wood, metal, or plastic, by Black & Decker; the Series A right-angle sander by Buckeye Tools; and a light-weight, high-speed angle sander by Chicago Pneumatic. An unusual disk sander by Detroit Surfacing Machine rotates the disk in a clockwise direction while imparting a counterclockwise motion to the head to produce a fine finish at high speed. A new lightweight orbital sander shown by Sundstrand is air operated, weighs only three pounds, and uses only five to seven cfm of 40-psi air. Other exhibitors in this field included Aro Equipment, Porter-Cable, Rotor Tool, and Skil Corp with a wide range of small belt grinders, belt-grinding attachments, disk and drum grinders and sanders, and straight-line and orbital sanders.

Particularly noteworthy was a vibratory lapping machine by Syntron in which the work is placed in a flat steel bowl, the bottom of which is lined with a sheet of abrasive cloth. An electromagnet in the base sets up vibrations that cause the work to rotate and at the same time to travel around inside the bowl. Light parts are held down by suitable weights, and a low-viscosity oil is circulated over the surface of the abrasive cloth. The machine is available with a 5-in. bowl for metallurgical specimen lapping, and with 12-, 24-, and 30-in. pans for production work.

Engelberg Huller showed a new conveyorized machine with two abrasive-belt heads for finishing both sides (sequentially) of a workpiece in a single pass, as well as a wide abrasive-belt-grinding attachment that can be applied to planers or planer-millers. Another interesting machine by the same company was a four-head unit for continuous roughing and finishing.

Hammond Machinery Builders demonstrated an automatic indexing machine for carrying work under a series of grinding belts or coated abrasive wheels for polishing straight, curved, or contoured surfaces, and an interesting belt grinder-polisher combining contour, flexible-belt, and flat-surface machining in either vertical or horizontal position, and with built-in dust collector.

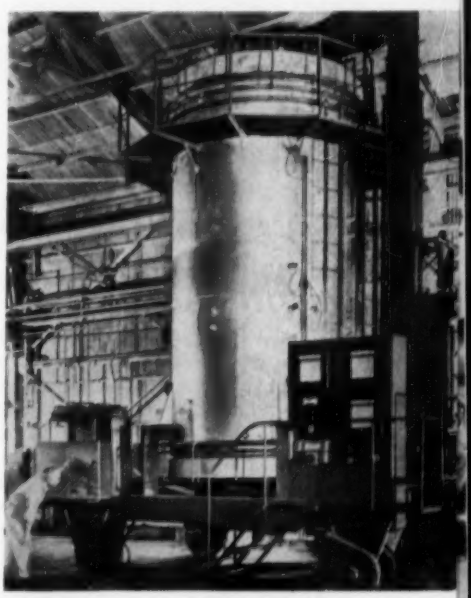
A three-ton centerless grinder by Production Machine Co is designed to handle bar or tube up to 4 in. in diameter, and will perform heavy stock removal or, by changing belts, will produce fine surface finish. Where several passes are required, a traverse reversing mechanism permits grinding in both directions of traverse. A similar, but smaller, machine was set up for production grinding and polishing short pins, using a gravity chute feed to the roughing grinder with progressive discharge to semi-finish and finish centerless belt grinders. Also shown was a twin-belt surfacing machine for finishing both ends of a workpiece simultaneously.

A twin-belt polisher by Nichols Equipment Co uses opposed belts and automatic work traverse to finish the two-way taper on knife blades, finishing both sides simultaneously, and working wet or dry.

For polishing rectangular or out-of-round parts, Acme Mfg Co showed a heavy-duty semi-automatic machine with cam control. By locking the oscillating movement, the machine may also be used for cylindrical work.

An abrasive-belt swing-frame grinder for heavy production was shown by Grinding & Polishing Machinery Corp. Using a 5-hp motor and 3-in.-wide belt, the machine demonstrated was a pilot model not previously shown.

In addition to machines, there was a broad range of contact wheels, including an air-inflated type, as well as slotted expander wheels for drum sanders, abrasive wheels built up of hundreds of leaves of abrasive cloth (one model of which was constructed with alternate leaves of lubricant-impregnated paper), and brush-backed wheels with built-in magazine for strips of abrasive cloth.



Mobile Heat-Treating Furnace at Cal-Doran

SELF-PROPELLED FURNACE for heat-treating parts up to 16 ft long has been designed from standard components by engineers at Cal-Doran Co, Los Angeles. Working under controlled atmospheres, which are contained in an inner retort made by welding retorts from two-existing pit furnaces, furnace is rolled over quench-pit loading station, where loaded spider is drawn up into heating chamber

Predict Banner Tool and Die Year

HARTFORD, CONN—Another good tool and die year is anticipated for 1957 by representatives from every segment of the contract tool and die industry, attending the 11th Annual Convention of the National Tool & Die Manufacturers' Association here November 1 through 4.

Not only that, tool and die manufacturers expect their 1956 volume of shipments of special tooling to better $800 million. This would mean an all-time high for the industry. Next year's business should be just as good, the industry thinks, but most tool and die plant owners say that because backlogs are small at present, they cannot with confidence predict industry trends much beyond early 1957. Here, area by area, are industry reports and predictions:

• **Detroit:** tool and die plants have enjoyed an unusually busy year because of major '57 model changeovers, and anticipate even bigger orders next year. In fact, Detroit shop owners say many '58 model retooling orders are already in.

• **Philadelphia:** shops in this city, also strongly affected by the automotive industry, expect to be heavily engaged in 1958 auto retooling programs throughout next year. One owner, "greatly optimistic," expects his force to be busy for at least six months. Most plants in Philadelphia are averaging 50 hours a week.

• **New England:** Here, too, plants look forward to a busy 1957. Increasing tooling orders for aircraft, guided missiles and other government projects will improve the situation—as will at least one major tooling program now being farmed out.

• **Los Angeles:** shops have had "a very good year" out here. A large influx of business is anticipated right after the first of the year, most of it in such defense projects as aircraft, guided missiles, and electronics equipment. Some plant owners report they have backlogs for the first time in a long, long while.

• **New York City:** This center, which serves a wide range of production industries and is therefore a good yardstick, also looks forward to 1957 with confidence. One owner reports that his plant is "very active," and says that other owners have told him they expect to have "all the business we can handle."

Tool and die manufacturers' optimism over the future was paced by one of the Convention's principal speakers, Murray Shields, New York economist, who predicted that 1957 will see "a period of expanded incomes and higher production, with quite a lot of new highs in our economic statistics." But, he said, "gains in production next year seem likely to be moderate rather than spectacular, with the year going down in our records as neither a period of rolling boom, nor of rolling recession, but of rolling competition."

Ex-governor of Kentucky Keen Johnson, vice president of Reynolds Metals Co, paid tribute to the tool and die industry as an important factor in enabling the United States to turn out nearly half the world's products with only 6% of the world's population. Tool and die shop "genius," he said, is the basis for America's giant industries such as automaking, which this year alone spent more than $1 billion on tooling new models.

AGMA's Agenda: from Personnel "Untestables" To Ultra-Fine-Pitch Gearmaking

CHICAGO, ILL—Six vital characteristics of a prospective employee cannot be tested by any present method. These are the "holes in the testing cheese," according to William S Sadler, Jr, of Sadler & Associates, speaking at the 1956 semi-annual meeting of the American Gear Mfrs Association at the Edgewater Beach Hotel here, October 28-31. Mr Sadler's subject was "Industrial Psychology"—and of course the psychological testing that goes with it.

The six untestable elements are:

• **Moral Honesty** . . . No known test will reveal the forger, the confidence man, the petty pilferer.

• **Job Knowledge** . . . Tests will show ability, but experience only becomes manifest as the job shows it does or doesn't exist.

• **Social Acceptability** . . . In some jobs, the wrong side of the tracks, the wrong church, or the wrong color will foredoom a man to failure.

• **Personal Appearance** . . . Some elements of personal appearance and habits may not show in the interviews or testing, may raise havoc later.

• **Wife Effect** . . . Is the man's wife a helpmate, a harridan, a problem? Inevitably, what she is will affect what he does.

• **Boss Effect** . . . Does the man's personality clash with that of his prospective boss? Both can have good personalities, but just not get along. It's no one's fault—they just can't work together.

Personnel Handling

Mr Sadler suggested that these six be in the mind of the employer for immediate checking when the new man comes to work. He further suggested these four factors for success in handling people: empathy (understanding), intelligent sympathy (tolerance, fairness), friendliness, and just plain common durability.

Papers on "Basic Causes of Gear Tooth Failures" and "Gear Size Specification and Measurement" were presented, and a great number of committee meetings were held. New inspection classifications are being worked out, plus a translation of the German standard classification, which is much more elaborate than ours. A machine-tool gearing task committee is examining all AGMA standards to see how they are interrelated with, and affected by, machine-tool practice. Attendance at the meeting was slightly larger than it was last year—itself a record-breaker, but a new method of programming spread attendees into a greater number of meetings. A particular high-spot was a symposium on ultra-fine-pitch gear making, a problem generated by aircraft and missile emphasis on miniaturization and close tolerances.

Richard E LeBlond

Carl E Linden

LeBlond Buys Fosdick Machine Tool Co

Midwest...

CINCINNATI—The Fosdick Machine Tool Co has been purchased by the R K LeBlond Machine Tool Co and will continue to operate as an independent business under Carl E Linden, who has been appointed president after having served as general manager of Fosdick for more than 23 years. All other Fosdick personnel will be retained.

Fosdick has been acquired by LeBlond as a move toward diversification, Richard E LeBlond, president asserts. Fosdick makes drilling, precision jig boring and grinding equipment, employs 200. LeBlond employs 1000.

Established in 1882, Fosdick has grown steadily, and its plant facilities have doubled since 1941. LeBlond was founded in 1882 by the late machine tool pioneer, R K LeBlond, moving from downtown Cincinnati to its present suburban location, where its plant now occupies 11 acres. LeBlond builds lathes ranging from a 13-in. bench Regal to automatic crankshaft units.

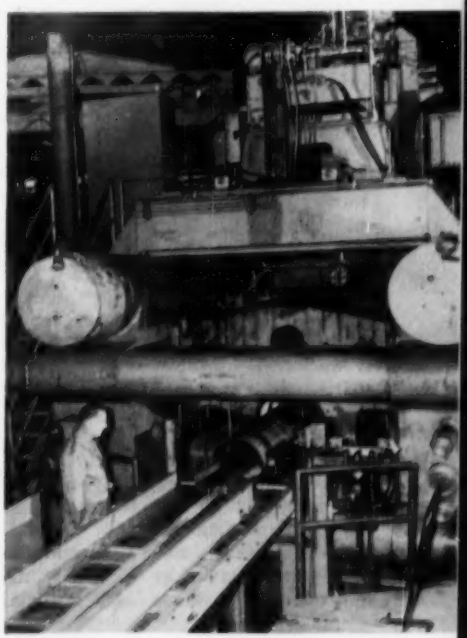
Midwest newsnotes . . .

Automated equipment will replace 30,000 jobs as the automobile industry swings into production of 1957 models, according to Clair L Taylor, state superintendent of public instruction for Michigan. Result: fewer unskilled or semi-skilled jobs, and an increasing demand for high-skill workers . . . **Chevrolet's** new transmission plant at Toledo, Ohio, has started assembly line production. Tooling will not be complete until year's end; current employment of 500 will be upped to 2500 as soon as plant is in full operation. Facility will produce all sheet metal and forged parts consumed in transmission manufacturing, and some of the die casting; it's the first time Chevrolet has die cast aluminum parts . . . Michigan is steadily dropping among states in defense production. It received contracts worth $221,394,000 for the first six months of '56; California got $2,265,852,000 for the same period. Governor's Emergency Industrial Commission is advocating establishment of a permanent Michigan bureau in Washington to fight for government contracts . . . **Republic Steel Corp** is expanding its steel and tubes division plant in Ferndale, Mich, for production of light wall conduit tubing. New building and equipment will run to $3 million . . . **Minneapolis-Honeywell Regulator Co** will construct a new three-acre manufacturing plant and home office for its valve division at Fort Washington, Penna . . . Buick reports there is a big swing toward bright colors in car interiors; white has advanced to the front . . . **Goodyear Tire & Rubber Co** is making its "safety tire" (has built-in spare) in the 14-in. size. Talk is that in addition to De Soto station wagons, others in the industry will add the tire in future models and dispense with the spare . . . **Chevrolet Motor Division's** assembly plant in Norwood, Ohio, turned out its 3-millionth vehicle at the end of last month . . . **Borg-Warner Corp** of Chicago has announced formation of a "Builders Sales Division" in a move to supply builders with the first complete "basement to roof" package of home equipment, household appliances, and building materials from a single source . . . Detroit is looking toward a $25-million market in gas furnaces and gas-fired appliances as soon as new gas pipeline service is completed . . . **Chrysler** has an $18,800,000 contract for guided missile work.

West...

Newsnotes from the West . . .

Lockheed Aircraft has received a $50-million re-order from the Navy for WV-2 Super Constellation radar planes. This fifth Navy order will extend deliveries of the big high-flying radar stations through 1958 . . . **Task Corp,** Pasadena manufacturer



8000-Ton Extrusion Press for Harvey

NOW IN FULL PRODUCTION at Harvey Aluminum, Torrance, Calif, is this 8000-ton, 288-ft-long hydraulic press, now turning out aluminum aircraft extrusions for aircraft and missile structural components. The 4-million-lb (weight) press is the first to be operated in the West under the Air Force Heavy Press Program

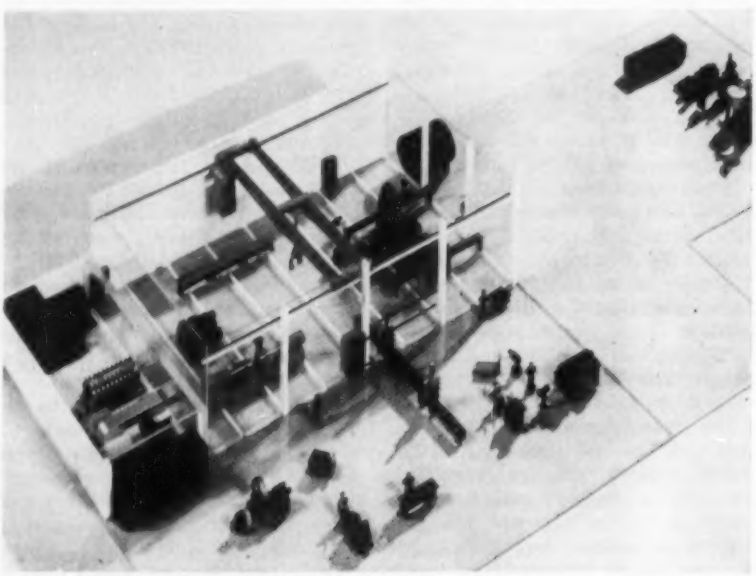
FIELD REPORT

of electro-mechanical and hydrodynamic equipment, special motors, and instrumentation, is moving its three facilities in the Los Angeles area to a new $200,000 plant nearing completion at Anaheim, Calif. Consolidation will increase production capacity by 75% . . . **Hoffman Laboratories Inc**, division of Hoffman Electronics Corp, Los Angeles, has a $22-million Navy contract to turn out 6001 units of the airborne portion of the Tacan navigation system. New order brings total military backlog to $43 million . . . **Skagit Steel & Iron Works** has closed its 106-mm shell casing plant at Sedro Woolley, Wash, because of a steel shortage. Shutdown is expected to end in late November . . . **Electromation Co,** formerly headquartered in Burbank, has relocated in Santa Monica. Move will consolidate activities of all divisions producing coaxial switches, magnetic tape recorders, timing generators, and telemetering equipment . . . **General Electric** will set up headquarters of its computer department in Phoenix, Ariz. Second of GE's national departments to take to the trail (first: the atomic products equipment, shifted to San Jose, Calif, in September), Phoenix HQ's will house administrative, engineering, research facilities first, eventually will expand to include manufacturing . . . **Dalmo Victor Co,** biggest US manufacturer of aircraft radar antennas, has opened its $2-million plant at Belmont, Calif. The 200,000-sq-ft facility will consolidate operations formerly scattered throughout six buildings on the San Francisco Peninsula . . . An 8000-ton extrusion press, first of its kind to be operated in the West under the Air Force heavy press program is now in full production at **Harvey Aluminum,** Torrance, Calif, producing out-size high-strength aluminum alloy shapes for military, defense, and commercial needs. Companion 12,000-ton unit, largest ever built in the US, is being assembled at the Torrance works; operation will complete the government's heavy press program, estimated over-all at $279 million . . . Manufacturing employment in the Los Angeles area set a new record in September: 777,400—an 83% climb over the past six years. Biggest gain, electrical machinery field; aircraft-parts manufacturing, second . . . **Northrop Aircraft** reports a drop in net income for fiscal 1955-56 despite record high total gross ($322 million).

South . . .

Southern shorts . . .

Georgia Power Co will build a $13-million electric generating plant in Brunswick . . . **SKF Industries,** Philadelphia manufacturer of ball and roller bearings has just completed setup of a 25,000-sq-ft warehouse in Atlanta . . . **Youngstown Manufacturing Inc,** Youngstown, Ohio, aluminum firm, plans to extend its operations in North Carolina and Georgia. Company, which acquired **Ford Metal Moldings Co** with a large plant in Louisburg, NC, also has a facility in Atlanta . . . **General Dynamics Corp's Convair Division** at Fort Worth has an AF contract to modify F-102A jet fighters. Fleet now being tested by the government will be converted to match new production models now being turned out by Convair . . . Work on tooling, jigs, and fixtures for three top-rated supersonic jet fighters is underway at **Lockheed Aircraft's** Georgia division at Marietta. Contracts amounting to $1,250,000 are scheduled for spring fulfillment. Division is also training AF personnel to maintain and repair the C-130 Hercules. Air Force has 26 of its top airmen and civilian technicians at Lockheed for study of the big transports . . . New metalworking industries announced for North Carolina during the past nine months will provide 1555 jobs, nearly $4 million in payroll . . . **Douglas Aircraft** has scheduled a large-scale expansion program in the tooling department of its Charlotte, NC, guided missile plant. Majority of tools will be designed and fabricated there . . . **Buffs Best,** subsidiary of **Lyons, Inc,** Detroit, is building a new metalworking plant at Huntland, Tenn . . . **Mid-South Metal Products Co** of Memphis will put up a new $100,000 facility for production of 155-mm illuminating shells . . . **Clarostat Manufacturing Co,** maker of electronic



Inert-Atmosphere Moly Plant

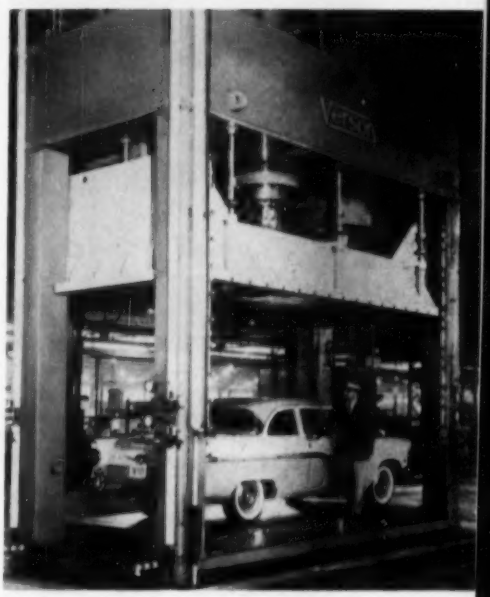
This is "In-Fab," Universal-Cyclops Steel Corp's unique inert-atmosphere pilot plant that allows fabrication of molybdenum and other refractory metals in a completely enclosed room under an inert atmosphere at temperatures to 4000 F. The plant (AM—September 24, '56, p101) heats and forms moly ingots into forged and rolled products, maintaining its inert atmosphere by using three air locks, one for equipment, one for supplies, and one for personnel. Operators use air-cooled "space suits" hooked up to intake and exhaust manifolds, with an emergency supply of enough air in the suit to see a man safely out of the plant if anything goes wrong. The fabricating equipment: an impacter with a semi-automatic manipulator that breaks moly ingots down into billets, an indirect induction furnace, and a miniature 16-in. blooming mill

resistors, is planning to move its Chattanooga operation to Aurora, Ill . . . **Temco Aircraft** has a $2,400,000 AF contract for continuation of C-54 transport overhaul. Work at the Greenville, Texas, plant will continue through August '57. Greenville is also working on a half-million dollar contract for services and parts for an undisclosed number of TB-29's . . . **American Can Co** will put up a new plant in San Antonio. Facility, its third in Texas, will employ up to 150 people turning out 275 million cans a year for beer and food products . . . **J & J Manufacturing Co,** a new Memphis concern, has begun production of lubrication system impact guns used to free frozen grease joints so that regular guns can deliver . . . **Chromalox, Inc,** subsidiary of **Edwin L Wiegand Co,** Pittsburgh, has begun manufacture of electrical heating elements in Murfreesboro . . . **Georgia Power Co** plans to build a $13-million electric generating plant in Brunswick . . . New 8500-sq-ft plant is underway at **Mott Body Works** in Americus . . . **Armco Drainage & Metal Products** is putting up a $500,000 steel fabricating plant in Atlanta . . . **M & H Valve & Fittings Co,** Anniston, Ala, has let a contract for a $440,000 plant improvement and expansion program . . . **Alabama Bridge & Iron Co,** Talladega, has a $241,306 contract to construct Navy pontoons and angles.

East...

Eastern briefs . . .

New sign of automation; IBM has contracted with **Multra Corp,** Stamford, Conn, a subsidiary of **Barnes Engineering Corp,** for a machine to automatically sort, feed, and assemble nine parts of a relay that goes into IBM accounting machines and computers. Parts include frame, two springs, armature, coil, adjusting plate, and three screws . . . Navy has given go-ahead to **Bethlehem Steel Co** to start planning a 14,000-ton guided-missile cruiser with atom power, to cost around $87,500,000, including power plant. This will be first ship combining A-power with exclusive guided-missile armament . . . And two 3900-ton guided-missile frigates with conventional power will be built by **Bath Iron Works.** They'll carry Terrier missiles for anti-aircraft defense . . . First mill designed specifically to roll and forge titanium will be installed by **Titanium Metals Corp of America** at Toronto, Ohio. Plant will include about $8 million worth of mills, vacuum annealing furnaces, and heat-treating equipment . . . **Baldwin-Lima-Hamilton Corp** has issued a denial that it's buying an A-power plant for locomotives; contract with **Walter Kidde Laboratories,** Garden City, LI, is actually only a renewal of research work in progress . . . Meantime, **Walter Kidde & Co** has added a British plant at Northolt, England, and a German unit at Bleckede, near Hamburg . . . Navy's Sidewinder air-to-air missile, with performance advanced over Sparrow and Falcon, will be supplied with guidance and control systems under a $14,000,000 contract with **Philco Corp,** Philadelphia; Philco also has new $3,600,000 AF contract for technical services. **Avco Mfg Corp,** Nashville, Tenn, will make electric ranges for Philco, and has announced that Crosley and Bendix divisions will drop their appliance, radio, and TV receiver operations. Reason: "Unprofitable." Crosley has healthy defense backlog, but Bendix may be sold . . . One result of atom-for-peace program is that Sweden will build a 30,000-kw research and materials-testing atomic reactor, with components and design supplied by **ACF Industries,** New York. ACF order values around $2 million; total cost will be $5 million. Fuel, enriched uranium, will be bought from Atomic Energy Commission . . . Four aluminum companies are buying $35 million worth of pumpless rectifier systems from **General Electric,** including Alcoa, Reynolds, Kaiser, and Olin-Mathieson. GE is also getting a multi-million-dollar contract from the Army for development and production of arming and fuzing systems for guided missiles; work to be done in Philadelphia plant. Two other GE announcements covered a new electric-motor development plant, and a test and development center for bearings and lubricants, both plants at Schenectady . . . **Budd Co** has sold 318 RDC's (rail-diesel cars; stainless steel, self-propelled) but is just getting some on runs through Philadelphia, where the plant is located. Purchaser is B & O, who will use three-car trains in service from there to Pittsburgh . . . **Vertol Aircraft Co** of Philadelphia is talking merger with **Northrup Aircraft,** Hawthorne, Calif; nothing definite yet. Vertol has been trying to get its H-21 certified for commercial flying. Armed services use the 22-place helicopter, but no airline as yet . . . **Union Twist Drill** has bought controlling interest in R Stock & Co, West Berlin, Germany, which makes drills and other cutting tools . . . **Crucible Steel Co** now has full ownership of **Vacuum Metals Corp,** Syracuse and New York, attained by buying out interests of **National Research Corp** . . . **Standard Pressed Steel Co,** Jenkintown, Penna, is planning $30 million in plant expansion and modernization with new machines . . . Baltimore reports a $3.13 increase in average weekly production-worker paychecks in a year, including a $1.73 increase between mid-July and mid-August . . . New management at **Waltham Watch Co,** Waltham, Mass, will strengthen aircraft-instrument production by expanding development programs in that field . . . **Utica Drop Forge & Tool Co,** Utica, NY, has been made a division of **Kelsey-Hayes Wheel Co.** No changes in management or product distribution have been announced . . . Kelsey-Hayes also bought out **Koldweld Corp,** New York . . . **Bell Aircraft** has reorganized its Niagara Frontier Div into an aircraft and a weapons division, separated by product lines.



Auto-Size Plastics Press

BIG ENOUGH to hold a full-sized auto, this Verson hydraulic plastics press, installed at General American Transportation Corp's East Chicago, Ind, plastics plant weighs 400,000 lb, has a 100 by 192 in. bed and platen area

R E Price (left), general manager of the Gardner Machine Co, Beloit, Wis, has been named vice president and assistant general manager of Landis Tool Co, Waynesboro, Penna, parent company. **Vernon L Loofboro** (center), formerly in charge of the abrasive operation at Gardner, succeeds Mr Price. **John Mourer** (right), has been appointed assistant general manager there. He has been district sales manager of the Pittsburgh and Indianapolis territories for Landis Tool

Names in the News . . .

John C Coonley, president of Hydraulic Press Mfg Co, Mount Gilead, Ohio, has resigned his position "to pursue other activities to be announced at a later date."

John Burg, metropolitan New York manager for Kearney & Trecker Corp, has been named eastern district manager. **Alfred Hostvedt,** manager of the Syracuse territory, has been appointed Mr Burg's successor.

Irvin R Spangler has been appointed assistant sales manager for the machine and tools division of Michigan Tool Co, Detroit.

Robert C Lindberg has been appointed production manager of Firth-Loach Metals, McKeesport, Penna.

A L Coulson has been appointed vice president, sales, of the Ford Instrument Co Division of Sperry Rand Corp, Long Island City, NY. He was formerly sales manager.

Charles W Wesson has been appointed general manager of Eastern Machine Screw Corp, New Haven, Conn. He was formerly associated with Sargent & Co, in charge of the Schollhorn Division.

Ren C McPherson has been named manager of Dana Corp's Auburn (Ind) division. Former axle sales manager in the company's Toledo, Ohio headquarters, he succeeds **R E Woodcock,** recently transferred to the Marion (Ind) division as manager.

Warren E McKittrick, general manager of Allied Steel & Conveyors Division, Detroit, has been elected vice president of Sparton Corp, the parent firm, formerly Sparks-Withington Co.

J P Arndt, Jr, assistant general sales manager of Brush Electronics Co, division of Clevite Corp of Cleveland, has been appointed assistant to the vice president and general sales manager of the company.

John Beach has been appointed vice president of operations for Hall-Scott, Inc, Berkeley, Calif, manufacturer of combustion engines and electronic equipment. Prior to the appointment Mr Beach was manager of the Univac factory of Remington Rand, Univac Division of Sperry-Rand Corp.

Fred S Van Valkenburg (left), a vice president and director of Waterbury Farrel Foundry & Machine Co, has been elected board chairman to replace **R L Wilcox,** who retired recently. **A Dale Mitchell** (right), treasurer, has been elected president; he succeeds **Joseph Schaeffer** who died in September

W H Bennett has been named president of Hydraulic Press Mfg Co, Mount Gilead, Ohio, a division of Koehring Co. He moves up from the post of vice president, sales

Herbert Harig (left), president of Harig Manufacturing Corp, Chicago, has been elected president of the National Tool & Die Manufacturers Association. **Philip R Marsilius** (center), vice president of Producto Machine Co, Bridgeport, Conn, has been named first vice president, and **Jack Kleinoder** (right), secretary-treasurer of Volkert Stampings, Inc, Queens Village, NY, second vice president. Other officers elected: **Harold G Murdock**, vice president of Arrowsmith Tool & Die Corp, Los Angeles, secretary; and **Robert C Renner**, president of the East Dayton Tool & Die Co, Dayton, Ohio, treasurer

Frank J Smith has been elected vice president, marketing, of Columbus Bolt & Forging Co, Columbus, Ohio. He was formerly general manager of the company's consumer products division.

John E Lane has been promoted to the post of sales manager of the Detroit district for the Fastex Division of Illinois Tool Works, Des Plaines, Ill. He has been associated with the Shakeproof Division for the past ten years.

H Warren Gieffers and **Hans M Schiff** have been appointed works managers for consumer products and military manufacturing of Motorola, Inc, Chicago. Both men have been serving as assistants to the vice president, manufacturing.

Robert Logie has been appointed executive vice president of Firth Sterling Inc, Pittsburgh. Prior to joining the company, Mr Logie was president of National Roll & Foundry Co.

Frank X Zenisek has been named sales manager for Midwest Screw Products Inc, Cleveland.

Glenn Atchley has been named sales manager of a new industrial products division formed by General Logistics, Pasadena, Calif. He was formerly midwestern sales manager for the company, with headquarters in Detroit.

Joseph L Kane, Rear Admiral, USN (Ret), has been elected a vice president of Kennametal Inc, Latrobe, Penna.

Daniel N Gredys, plant manager in Cleveland for Perfection Industries Division of Hupp Corp, has been elected vice president, engineering. **H A Consor**, assistant to the president, has been appointed vice president, manufacturing, at the Cleveland plant; **John Gardner**, director of operations at the company's Waynesboro, Ga, plant, has been named vice president of manufacturing there.

William Rainey has been appointed manager of new product development for W-S Fittings Division, H K Porter Co. He will be headquartered at the Roselle, NJ, plant.

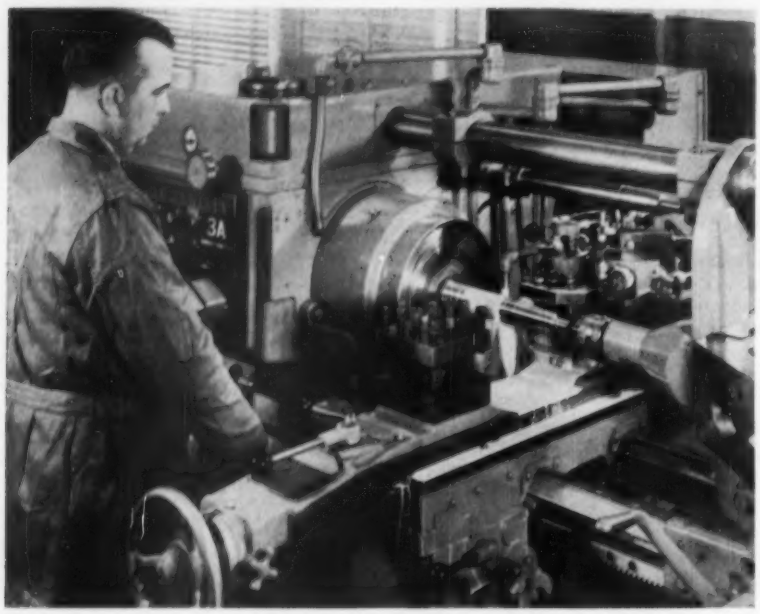
Kenneth G Hunt has been named superintendent of construction and shops at Crucible Steel Co's Midland, Penna, works.

John M Dolan has been named vice president, general manager of the field sales division of Giddings & Lewis Machine Tool Co. He was formerly vice president, sales, for Solar Aircraft Co

J J Keane has been appointed assistant general sales manager of Landis Tool Co. He has been manager of the Detroit sales office for the past ten years

Douglas R Starrett, vice president, plant operations, of L S Starrett Co, has been appointed executive vice president of the company

New Shop Equipment



Warner & Swasey Attachment Permits Hydraulic Contour Tracing

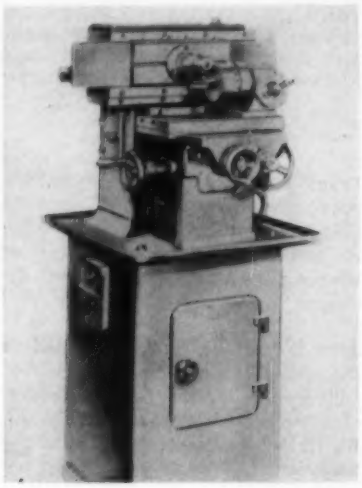
Designed for accurate contour turning and cross-center contour facing operations with 3A and 4A extra-heavy-duty turret lathes, hydraulic contour tracing attachment complements the hex-turret-mounted internal contouring slide tool announced recently (*AM*—Aug. 13 '56, p 177). Attachment, which is said to be capable of heavy metal removal, provides precise control of successive roughing, semi-finish, and finish cuts, using a single flat or round templet as the master pattern.

Attachment, which mounts at a 45° angle on the rear of lathe cross-slide, incorporates a six-position, hydraulically operated stop - roll similar in design to the stop-roll mechanisms used with the cross-slide and hexagon-turret units on company's lathes. By presetting the individual stopscrews of the tracer's stop-roll to the desired depths of cut, operator can make as many as six successive templet-controlled cutting passes across the workpiece, without need for any manual cutting-tool adjustments. Successive heavy roughing cuts and lighter finishing operations on contoured parts can be completed in only one setup, with no templet changing required.

The single templet pattern for the tracing attachment is mounted in a bracket attached to unit's overhead pilot bar. Conversion of the tracer from contour turning to facing operations is accomplished with the installation of a special holder in the templet-mounting bracket, which positions the facing templet at an angle of 90° to the spindle centerline. A two-position hydraulically indexed and clamped turret holds the attachment's rough and finish cutters. Actuation of the tracer slide is by a large hydraulic cylinder powered by a separate hydraulic pump unit. Cylinder has a 6-in. stroke which provides an effective maximum cutter travel of 4 in., thus permitting the contour turning of work having up to 8-in. diameter differential or the contour facing of work with a height difference as great as 4 in.

Tracer can be retracted to its rearmost position when not in use, and the lathe on which it is mounted may be utilized for standard turret-lathe work without danger of tool interference. For max rigidity, attachment functions with machine spindle rotating in reverse.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio



Punch Shaper Produces Punches With Only One Chucking

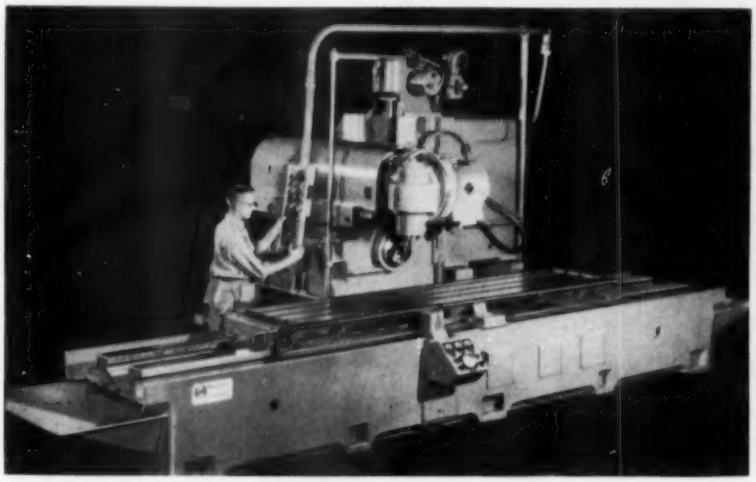
Gack contour shaping machine, Type K-150, is primarily intended to produce contour punches with curved necks, die sections, and formed cylindrical contours. To achieve the highest degree of precision, only one chucking is used for finishing of work; punches reportedly need no further machining operations. Work is clamped directly in a collet holder, between centers or to the coordinate chuck. Coordinate chuck and indexing attachment guides work along contour with one chucking, thus eliminating re-chucking errors.

All machining operations can be checked in the shaping process with a built-in 30-power microscope. Length of stroke is adjustable from 0 to 6 in., and speeds of 55, 80, and 120 spm are possible. All control elements are incorporated in the machine and completely enclosed.

750-lb machine has automatic feeds of from 0.0016 to 0.016 in.

Jersey Mfg Co, 417 Livingston St, Elizabeth, NJ

Materials and Parts . . .



Sundstrand Universal-Bed Miller Has Separate Table-Column-Head Feeds

Ridigmil milling machine combines longitudinal feed of the table, cross feed of the column, and vertical feed of the head. These feed motions are provided by motors independent of the spindle motor, so that full horsepower is furnished the spindle.

Machine has an all-angle ram head which is adjustable through an arc of 360° both parallel and crosswise to the machine table, to give practically any cutting angle desired. When not in use, the head can be retracted to clear the horizontal spindle.

24 speed changes are available on both the horizontal spindle and the all-angle head in a range from 14 to 1450 rpm. With the main spindle the hp range is 1 hp per rpm up to 50 hp max; all-angle head is provided with ½ hp per rpm up to 20 hp max.

With the fixed-height bed design cutter is positioned to work for convenience in loading large workpieces and easier observation of cutting operations. Bed design also makes possible the use of a wider table and longer table-feed strokes.

Feed movements are infinitely variable within machine range, and control switches are grouped on pendant. Machine is equipped with vernier scales for table, column, and head positioning. It has been designed with mechanical screw feeds for application of controlled tracing and programming.

Sundstrand Machine Tool Co, Rockford, Ill

Barksdale Pressure Switch Senses Two Different Pressures

Model 9622 pressure switch is capable of sensing two different pressures in one system and acuating independent electrical circuits at any two desired points. Device may be used to maintain a pressure where it is imperative that the system pressure does not exceed or fall below predetermined values. Range of device is from 15 to 3000 psi for proof pressures from 3000 to 7000 psi, depending on switch setting.

Switch incorporates two snap-action switching elements rated for ac and dc circuits; each element is electrically independent of the other. Pressure settings are made by two exernal adjustment screws.

Second switch, Model C9622, has two calibrated scales which enable operator to set visually either switch, without gages, before or after installation on a pressure line.

Barksdale Valves, Pressure Switch Div, 5125 Alcoa Ave, Los Angeles 58, Calif

...including

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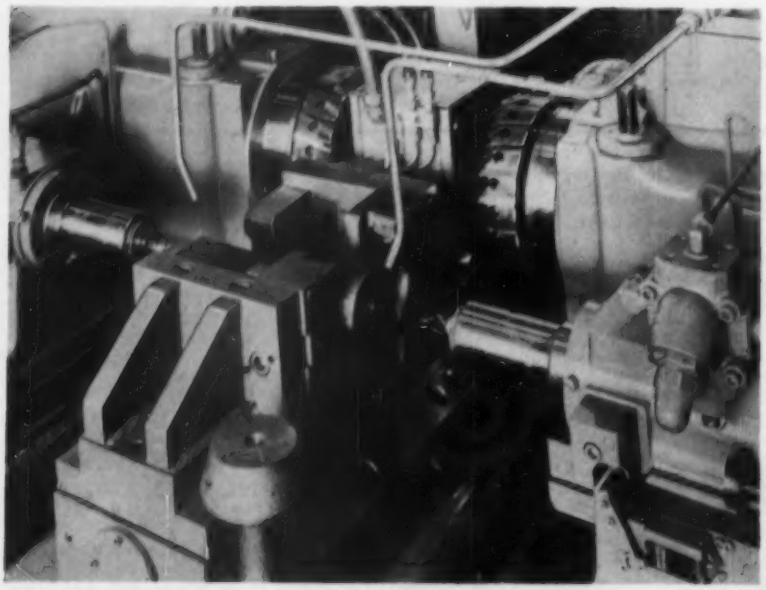


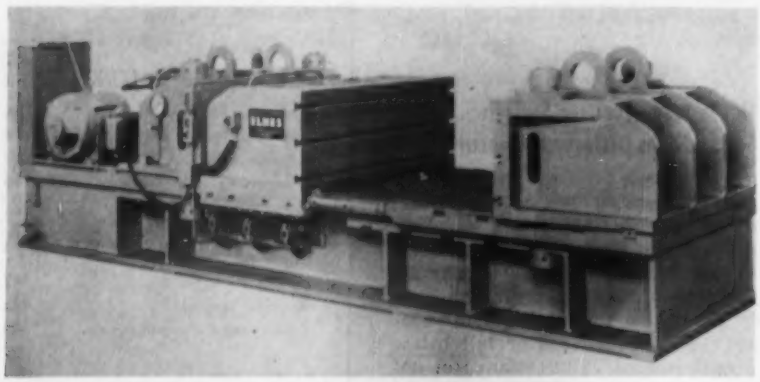
Motch & Merryweather Machine Mills and Center-Drills

Latest addition to company's line of milling and centering machines, smaller and more compact transfer machine is designed to double-end-mill and center-drill. Design employs in-line transfer principle; opposed milling heads and drill heads are way-mounted on either side of a fixture table.

Operator loads the fixture at the front. Fixture traverses to the milling heads at the rear of the bed. Milling heads advance from each side, mill, and return. The table then moves forward to the center drilling station, where two drill heads advance, drill, and return. Operator then unloads the machined part and reloads the fixture with a new part.

The fixture is hydraulically actuated for clamping. Cycle is completely automatic after part is loaded.

Motch & Merryweather Machinery Co, Machinery Mfg Div, 888 E 70th St, Cleveland 3, Ohio



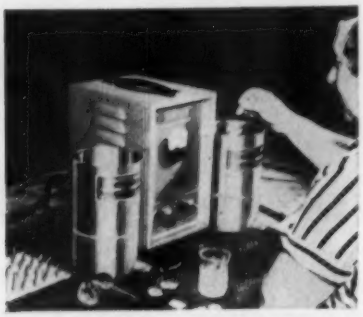
Elmes Hydraulic Unit Handles Heavy Bending Operations

200-ton Hydraulic Bulldozer, designed for heavy bending operations, has full electrical control for automatic or semi-automatic operation. Machine is completely self-contained for portability; control box and pumping unit are integral with the machine.

Unit has hardened-steel slideways. Bed is protected by reversible hardened-steel wear plate. Operation, including jogging, is by foot-switch control. No pre-setting of press stroke is necessary. To change jobs, operator simply changes dies.

Length of the machine is 17 ft 8½ in., width is 6 ft, and over-all height is 4 ft 8 in. Opening is adjustable from 12 to 60 in. Speeds in ipm are advance, 140; press, 41; and return, 285.

American Steel Foundries, Elmes Engrg Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio



Ultrasonic Cleaning Apparatus For Small, Intricate Parts

Model AP-10-B, latest in the Sonogen (R) Series, designed for bench-top operations, comprises a 36-40 kc/sec power generator and a cylindrical cleaning tank, with transducers hermetically sealed into the base.

RF power output of the generator is 50 w average, 200 w peak on pulses. Tanks are of 1-pt, 1-qt, or ½-gal capacity, giving maximum effective cleaning area of 18 sq in. Two of the smaller units may be operated simultaneously, two of the larger alternately. Generator and 1-qt transducer is priced at $350.

Branson Ultrasonic Corp, 37 Brown House Rd, Stamford, Conn

Leaded steel, called Hi-Qua-Led Steel, is available in all steel grades in forged and rolled rings from 18 to 145-in. over-all diameter and in ingots to 50,000 lb. Company reports that a variety of steel grades has been tested to date, and that in each case physical properties of the steel remained basically unchanged and pattern of lead distribution remained unaffected by the grade of steel. Addition of lead is reported to result in greatly increased machining characteristics.

Alco Products, Inc, Box 1065, Schenectady, NY

Her wires are crossed *and she loves it!*

Peerless crosses them for her freezer basket and they're happy, too!

Besides freezer baskets, Peerless Wire Goods cross wire welds a variety of refrigerator shelves, fan guards, dishwasher racks, etc. And Peerless knows that keeping themselves and everyone else happy in such an extremely competitive business requires a lot of production ingenuity.

Here's why: Success in the wire products business depends on methods. And the sheer ingenuity of Peerless methods *requires* the capacity of Sciaky patented three-phase resistance welding equipment . . . which is not unusual, because the Sciaky technique of fabrication is designed to put the profits back into manufacturing!

Whether or not *you* make wire goods . . . if you fasten metals together to make your product, do it faster, better and at lower cost with Sciaky resistance welding techniques—like Peerless does.

SCIAKY®

Largest Manufacturers of Resistance Welding Machines in the World

The facts are impressive—turn the page and see for yourself...

Ingenious Tool-Up Produces 45 Cross-Wire Welds per Stroke

Sciaky Patented Three-Phase Resistance Welding Readily Satisfies This Unusual Demand

Imaginative tooling applied to a Sciaky 150 KVA patented Three-Phase press type welder has put Peerless Wire Goods, Inc., Lafayette, Ind., in a solid position in a field where the ultimate in efficiency of methods and equipment is necessary for survival.

In the fabrication of freezer baskets, for example, Peerless makes 45 cross wire welds simultaneously with one stroke of the welder, an unusual demand that can be satisfied only by the Sciaky patented Three-Phase principle of operation. Equally as important, Sciaky Three-Phase control eliminates burrs and splashes at the weld.

Dishwasher baskets have 124 welds made in twelve strokes—another big saving in time and handling.

Jobs like this provide good examples of the concept behind Sciaky Resistance Welding Techniques . . . *to put the profits back into manufacturing.*

Another example of how the Sciaky technique of fastening is used in cross wire products is given in "Resistance Welding At Work", Vol. 3, No. 9. Write for your free copy, today.

Upper—All the welds of a side web being made simultaneously. *Lower*—View showing the multiple electrode tooling that makes 45 welds per stroke.

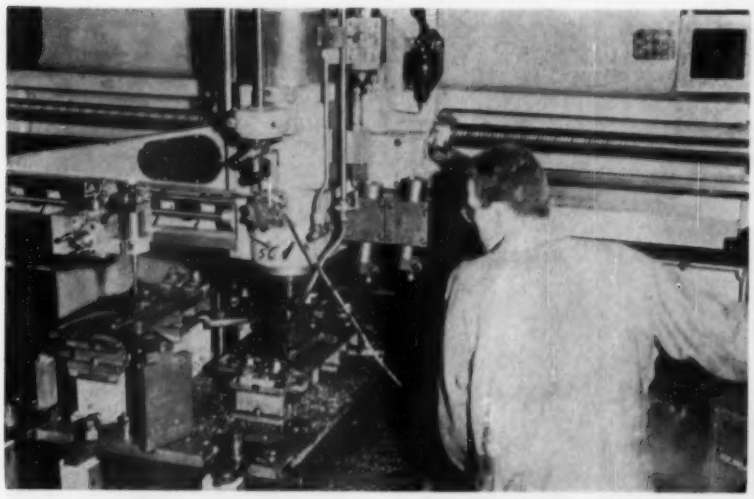
FOR SPECIFICATION WELDING

If you must do precision welding such as required for air frame, jet engine and ordnance manufacture, ask about the new Sciaky Predetermined Electronic Counter Weld Control. Write for Bulletins 338 and 339.

Largest Manufacturers of Resistance Welding Machines in the World

SCIAKY

Sciaky Bros., Inc., 4926 W. 67th Street, Chicago 38, Illinois, POrtsmouth 7-5600



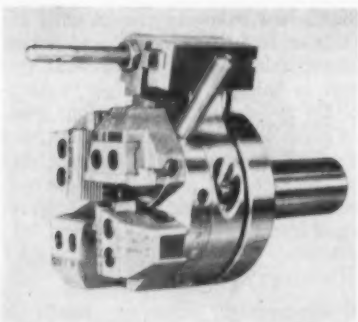
Tracer Control Systems Offer Duplication at High Speeds

Developed in conjunction with Pegasus Laboratories, electronic-hydraulic tracer-control systems are identified as E-Series Duplimatics, and are designed for tracing at speeds required by the airframe industry. An important feature of the three-feed Duplimatic is that it accomplishes plane and depth control with a single probe.

High feeds, up to 100 ipm, are available with the equipment. Only limit of speed lies in the natural frequency of the machine tool itself; response-stiffness of the system is said to be far in excess of present machine-tool design.

Series allows tracing within full range of the machine tool. Conventional operation of machine tool is not restricted. Unimpeded use of all conventional controls is accomplished after installation by automatic push-button interchange. Equipment can be supplied as original equipment on machines or can be installed on existing machines. Natural frequency of the machine tool can be predetermined and tracer performance predicted prior to installation. Company offers to demonstrate the controls to machine-tool builders and major tracer users during the introductory stage. Illustration shows system installed on a milling machine.

Tracer Control Co, 595 E 10 Mile Rd, Hazel Park, Mich



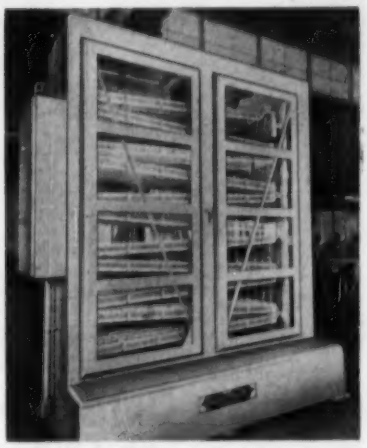
Landis Taper Threading Head Applies to Small-Bar Automatics

No. 5C Landmatic taper-attachment die head has been developed for precision taper-threading operations on No. 2 B & S and other small-bar automatics. Compactly designed, this stationary-type head has a ⅛- to ¾-in. pipe-threading range. It is equipped with a taper attachment which expands the chasers at a rate equal to the required taper as the die head advances onto the work; thus cutting action is limited to the throat section and first full tooth of each chaser. Cutting strains are reduced, longer-than-normal taper thread lengths are obtained, and truly conical threads are produced with no chaser leave-off marks. Threads are said to meet dry-seal specifications.

Adjustable stop bar attached to machine arrests the cam as the die head advances. Sliding movement of cam slide along the cam allows head to open gradually during threading, at a uniform rate equal to that of the required taper. Separate cam and cam slide are required for each taper; however, they can be used for all diameters requiring that degree of taper. Maximum thread length is limited to the length of the cam slide (¾ in.); but shorter lengths can be cut by adjusting the point of stop bar contact with the cam.

Attachment features an adjustable spring mechanism which allows compensation of machine's cam lead for threads of different pitches. With it, head can be adjusted for amount of pressure necessary for pitch of thread to be cut.

Landis Machine Co, Waynesboro, Penna



Parts Bank Prevents Delay On Automated Production Line

Unit designed to be placed between machines on a production line consists essentially of zig-zag gravity feed tracks and parts elevators. Construction is such that the number of parts in the "floating bank" may be anywhere from several hundred to more than 5000. If one machine in line is shut down, the bank insures continued production on following machine by feeding parts previously stored.

Parts that come into storage tower are raised to the top of the cabinet by a roller-chain elevator that is powered by a cone-drive speed reducer. Pneumatically controlled escapements with electrical interlocks are used to handle flow of parts from unit to the succeeding operation. An automatic size gage may be included at entry end to prevent the entry of an oversize part from the preceding operation; a caged track within cabinet prevents the introduction of off-limits parts that might damage machines or tools in subsequent operations.

Michigan Tool Co, Gear-O-Mation Div, 17140 E Ten Mile Rd, East Detroit, Mich

Keystone Optical Grinding Machine Generates Light-Refracting Forms

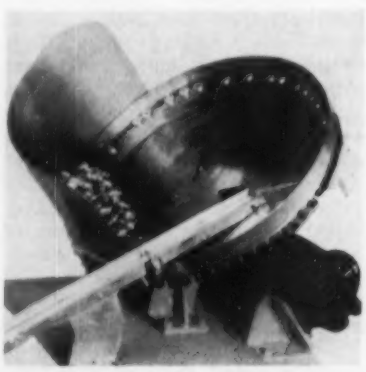
Called a "refractoform" grinder because of its ability to generate any spherical, aspherical, rhomboid, polyhedron, prismatic, or other form which can refract light, optical grinding machine is said to accomplish in 7 min work that formerly required as much as 33 man-hours on other equipment. Machine, designed and built for Northrop Aircraft to that company's specifications, is hydraulically motivated by two sets of high- and low-pressure pumps, and features a vacuum chuck which can accommodate work up to 40-in. diameter.

Vacuum chuck consists of a polished perforated plate and a flanged neoprene rubber gasket which grips base of work tightly when vacuum is applied. Vacuum system generates 12 psi to hold work.

Machine reportedly grinds quartz, glass, or metal to extremely precise optical tolerances. Operator has infinite control of dimensions, so that machining can be carried more nearly through to the polishing stage than on conventional equipment.

Shutoff system stops machine drive if vacuum system incorporated in chuck design fails. A walk-in pit beneath the machine allows easy inspection for hydraulic checks and the periodic reading of the strain gages on which machine bed sits. Separate unit houses the hydraulic pumping equipment.

Keystone Engineering Co, 1444 S San Pedro, Los Angeles, Calif

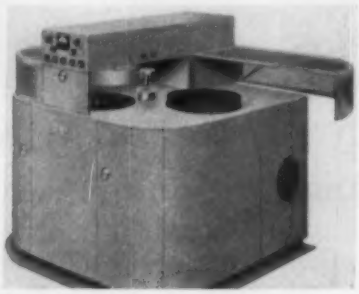


Hopper Feeds Cup-Shaped Parts At Speeds up to 500 per Minute

Pin Hopper can be used to orient and feed parts that are cup shaped or that have holes or indentations.

Flat revolving plate, inclined at an angle, has spaced, retractable pins around its circumference; diameter and location of pins depend upon parts to be fed. Pins are cammed upward to pick up the piece from mass of parts in the hopper; parts not picked up drop back. As item approaches adjustable track, pin is retracted by camming device, releasing piece into the track. Parts overflow back into the hopper when track is full.

US Engineering Co, 40-24 22nd St, Long Island City, NY



Automated Spin Test Machine For Cutoff Saws, Grinding Wheels

Autospinner can be used for one-at-a-time testing at controlled speeds up to 15,000 rpm. Unit can be integrated into production line, or used for batch testing.

Machine loads, spins, unloads automatically; acceleration and deceleration rate is adjustable. Vacuum transfer arms handle porous as well as dense, abrasive cutoff saws up to 20-in.-dia. Details in bulletin 756.

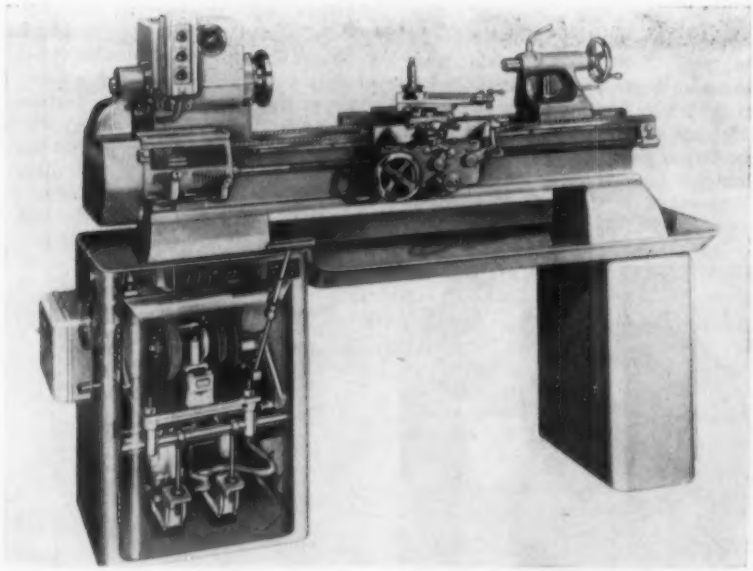
George L Day Co, 1227-1231 Niagara St, Buffalo, N

Small-tool balancer can be used for tools up to 5 lb in weight and where larger balancers are impractical. Device is said to provide great flexibility in range of applications, ease of mounting, tension adjustment, and portability. Circular housing, from which tool-holding wire hangs, contains oilite bearings and case-hardened spindle.

Martin, 100 Martin St, Mohawk, NY

Brush-backed polishing heads in company's line are now available with short or long bristle brushes in the 32-, 16-, and 12-in. models. In addition, the 32-brush head is available in a 1-in. abrasive width. Bulletin 102.

Grinding & Polishing Machinery Corp, 2530 Winthrop Ave, Indianapolis 5, Ind



Sheldon Toolroom Lathes Feature Heavy-Duty Variable-Speed Drives

Series of 11- and 13-in.-swing lathes incorporates an oversize heavy-duty drive unit which takes a 2-hp, 3-phase motor. Double V-belts throughout the drive from the motor to the spindle deliver maximum gripping power.

Infinitely variable speeds are provided from 40 to 1800 rpm in the machines. Speed changes are made visually and instantly by raising or lowering a T-handle speed-selector lever; tachometer dial built into headstock provides readings of spindle at any time. Only 9 sec are required to change from low to high speeds in either direct drive or back-gear. Spindle speed range is 200 to 1800 rpm in direct drive and 40 to 300 rpm in back gear.

Other features of series include tapered roller spindle bearings, a 54-pitch gearbox, and a friction-disk clutch for engaging power longitudinal and power cross feeds. Complete range of toolroom and production accessories can be obtained, including flame-hardened bedways, taper-key-drive spindle noses, bed turrets, and air attachments. Bed lengths with center distances of 26, 36, and 48 in. are offered.

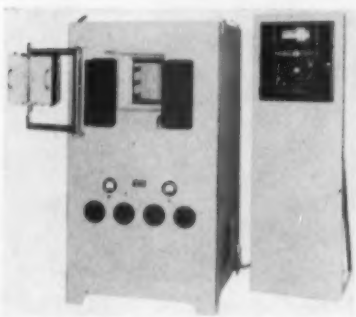
Sheldon Machine Co, Inc, 4258 N Knox Ave, Chicago 41, Ill

Compact Lubro-Control Unit Designed for Machine Tools

Cabinet-type Model 33AG-4 (6 x 6 x 5¼ in.) supplies air-actuated feed mechanisms, chucks, clutches, brakes, with filtered air, regulated air pressure, and Micro-Fog lubrication.

Advantages include visible oil feed for accurate flow control and positive proof of lubrication; lubricator performance over an airflow range of 4 to 85 cfm; ⅝-pt oil reservoir; choice of 64- or 25-micron filter element; two auxiliary air take-offs for supplying filtered air for other than lubrication purposes. Unit is designed for main-line air pressures not exceeding 150 psi, and for regulated pressures of less than 125 psi; available in ½-in. pipe size.

C A Norgren Co, 3400 S Elati St, Englewood, Colo



L & L Electric Furnaces Provide Temperatures to 2750 F

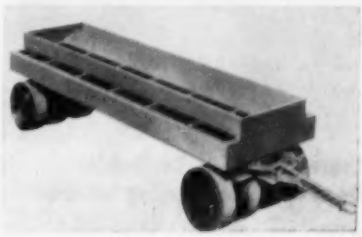
Special silicon-carbide, non-metallic heating elements are used in two electrically heated furnaces added to height and width of the firing chamber. Size of chamber is not altered when baffles are installed in furnace interior to reduce the effects of radiation from the silicon-carbide heating elements.

L & L Mfg Co, 136 8th St, Upland 79, Delaware Cty, Penna

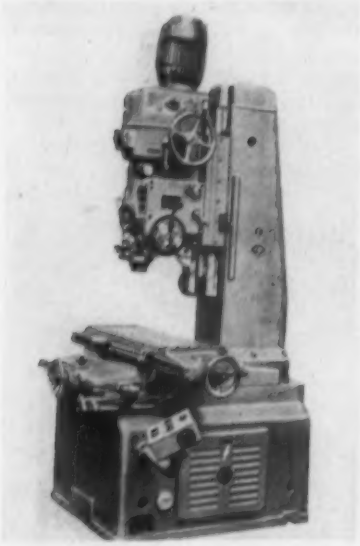
company's line: Series NB has temperature range from 300 to 2500 F; Series NBH provides temperatures from 300 to 2750 F. Heating elements are normally located on the sides of the firing chamber. A wide selection of voltage adjustments prolongs the life of the elements.

Case construction is of heavy sheet metal. All units are of floor-type construction, and transformers, contactors, and temperature controls are installed in the base, except special controls which require a special instrument panel. At extra cost, control over the firing-chamber gradient can be obtained for extremely critical heating procedures.

Door openings are the same as the



HEAVY-DUTY TRAILER is intended for easy handling of heavy loads. Construction is of all-welded, heavy fabricated steel. Either fifth-wheel or caster type of construction is offered. Unit can be built to specifications, including platform height and capacity—*Palmer-Shile Co, 16019 Fullerton, Detroit 27, Mich.*

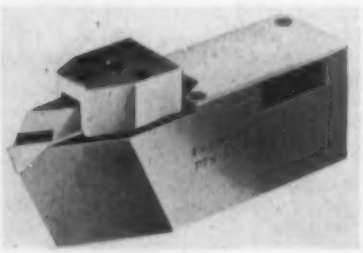


Optical Jig Borer Offered In Italian Version

Starrett optical jig borer, imported from Italy, includes the following standard equipment: electric motor and controls, work light, footpedal, covered-table prismatic guides, scales for reading rapid travel of table, and control panel complete with indicating light and emergency stop.

Range of spindle speeds is infinite from 70 to 1300 rpm. Depth of throat is 15¼ in. and vertical spindle travel is 7⅞ in. Other specifications: table surface, 35½ x 12½ in.; longitudinal travel, 19⅝ in.; cross travel, 7⅞ in.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY



Everede Carbide Toolholder Developed for Copying Lathes

Type GF carbide toolholder, designed for use on copying lathes, will reportedly machine any alloy at over 600 fpm and will machine mild steels at ½-in. depth of cut at 400 fpm, using 0.020-in. feed. Company reports also that holder can plunge-machine ⅛ in. deep at 30° and on the same part face out on a flange, all in one operation.

Device incorporates neutral or positive rake. Carbide-faced chipbreaker is infinitely adjustable on the job. Solid-carbide triangular toolbits 3½ in. long are available in all grades by leading manufacturers. Any nose radius and any lead angle can be supplied to customer's specifications.

Everede Tool Co, 2000 N Parkside Ave, Chicago, Ill

Esco Hydraulic Press Offered In 500-Ton Model

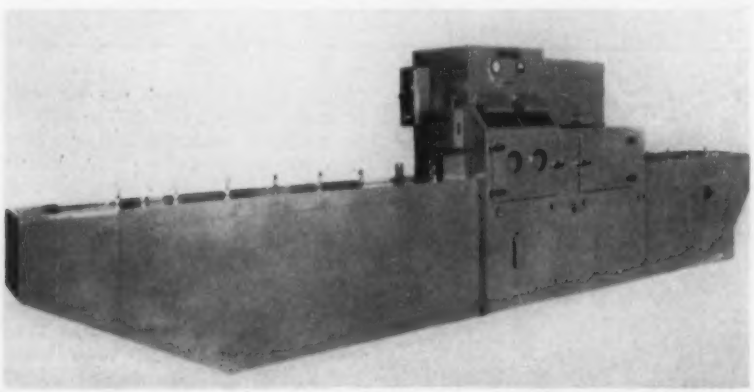
All-purpose 500-ton press, which requires less than 4-ft-sq floor space, is adaptable to such operations as stitching, forming, and binding. Design and weight (approx 4950 lb) eliminate need for pedestal mounting. Because there is no vibration or shifting during operation, it is not necessary to bolt press to the floor. Unit is fitted for left or right footpedal operation.

Low-pressure, fast pumping system utilizes a combination of hydraulic pressure and mechanical leverage which is said to overcome oil-leak problem. Press features closing speed of only 8 sec; opening speed is 6 sec. C-type frame provides free access to jaws.

All major castings used in unit are Esco Alloy 12M, a high-strength alloy steel with ability to resist severe impact and shock. Brochure No. 208.

Electric Steel Foundry Co, 2141 NW 25th Ave, Portland 10, Ore

RECTIFIER WELDER with "Diverter Path" control features case design which permits easy removal of side panels. Recessed control panel has polarity reversing switch, three coarse current adjustments with rheostat control for fine current adjustments. Unit has both thermostatic and current overload protection, is available in 300- and 400-amp models. Magnetic line contactor is supplied at no extra cost —*Hobart Bros Co, Hobart Square, Troy, Ohio*



CONVEYORIZED WET-BLAST UNIT is designed for high-production deburring of automatic-transmission components. Machine deburrs, hot-water rinses, rustproofs, and unloads at the rate of 360 parts per hr at 80% efficiency. Load section (at left) is lengthened to allow several parts to be loaded in advance, freeing operator for other duties—*Cro-Plate Co, Inc, 747 Windsor St, Hartford 1, Conn*

Multi-Barrel Finishing Unit

Model MMB multi-barrel finishing unit is a half-scale model of company's previously announced standard unit. As many as ten finishing barrels, 3 to 8 in. in diameter, can be mounted on the 24-in. revolving disk of the smaller model. As disk revolves, parts are subjected to a simultaneous rotary, centrifugal, and slide-honing action.

Unit features a variable-speed drive from 15 to 45 rpm, with forward and reverse control, and an automatic safety switch for the front guard; when guard is lifted, unit stops.

Choice of bench or floor model is offered. Bench model is supplied with 4-in. legs attached and has over-all height of 27 in.; with addition of three tubular-steel legs, unit converts to floor model with over-all height of 52 in.

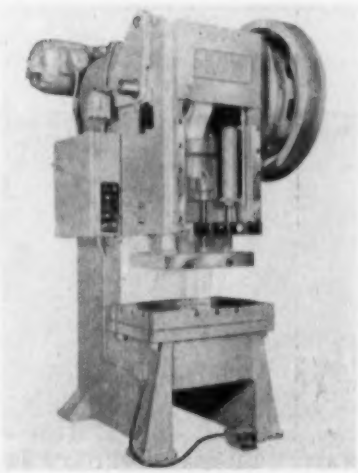
Maker invites the submission, for free tests, of a 10-lb or ½-cu-ft test sample, together with a desired finished piece. Sample will be processed to specifications and process sheets will be furnished to make cost comparisons.

BMT Mfg Corp, 116 E 9th St, Elmira Heights, NY

Sisal buff of air-cooled centerless construction is made of bias sisal wrapped in cloth. Sections of buff are held in place by steel rings; an almost unlimited number of sections can be locked together, making possible a buffing face of 12 in. or more in width. After required number of sections have been locked togther by rings, the rings are mounted on a telescoping hollow shaft. Thus the complete unit can be installed or removed from machine in a few seconds.

American Buff Co, 2½ S LaSalle St, Chicago 16, Ill

HEAVY INGOTS are cut on hydraulic saw which features a saw carriage that travels on a cross-beam above the ingot. This arrangement protects the moving parts—such as motor, carriage, saw-blade drive, and feed cylinders—from chips. Cycle is remote controlled, and all adjustments can be made from operator's stand. Mechanized chip conveyor can be placed below saw blade for automatic chip removal—*Loma Machine Mfg Co, 114 E 32nd St, New York 16, NY*



Minster Fixed-Base Press Offered in C-Frame Version

75-ton fixed-base G1 press is available in flywheel or geared type with single-speed or variable-speed drive for either type. Unit has long flanged slide with barrel adjustment and box-type cast construction to eliminate way deflection and increase guiding to attain slide-to-bed parallelism. It is available with standard manual slide adjustment or with air power adjustment. In illustration, cover has been removed to show slide and counterbalance location; two pneumatic counterbalances on slide are standard.

Standard stroke of slide is 4 in., with maximum 8 in. available. Single speeds of 90 or 120 spm are standard for flywheel presses, and 40 spm for geared type. Bed area is 24 x 36 in. Slide area is 18 x 24 in. Unit is also available in the inclinable type.

Other features: centralized press controls for clutch and drive; company's combination air friction clutch and brake unit mounted on crankshaft within flywheel or main drive gear; cyclic-type automatic oil system.

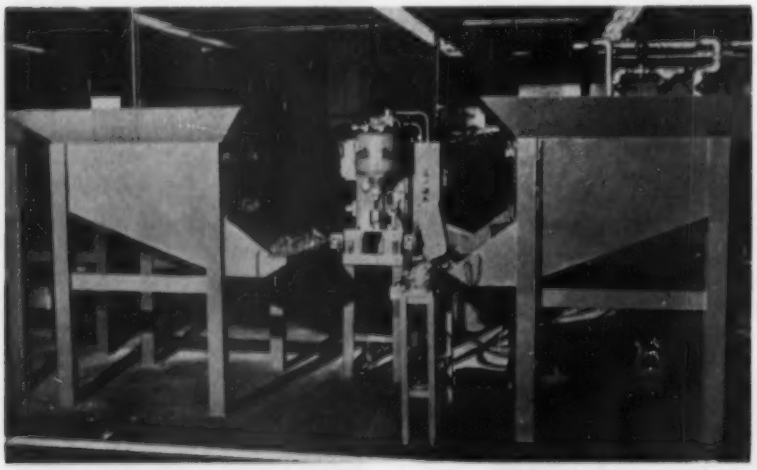
Minster Machine Co, Minster, Ohio

Four Accessories Offered for Delta-Rockwell Lathe

Designed to convert company's 11-in. metalworking lathe into a turret lathe, four new accessories include a bed turret, turret toolpost, lever-type collet closer, and coolant group. All are designed to fit both the 4-ft and 5-ft beds of the two models available.

Rockwell Mfg Co, Delta Power Tool Div, Pittsburgh 8, Penna

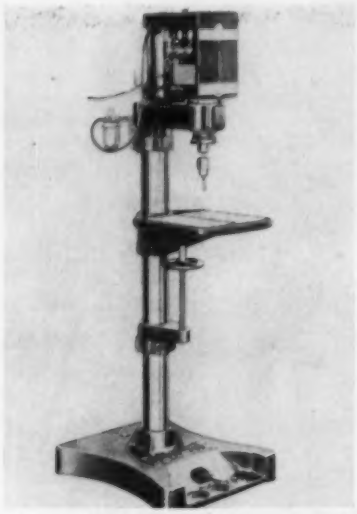
PLASTICS INJECTION-MOLDING MACHINE, Model 616-PP-12, can mold the recently perfected low-pressure, linear-type polyethylenes as well as other types of plastics. Pre-plasticizer design permits use of injection pressures 60 to 70% lower than those normally required. Because temperatures in heating chamber average only 45 F more than temperature of plastic when it is ejected, cycle can be interrupted without burning or changing viscosity of material in heating chamber. Model dry cycles 360 times per hr, shoots 22 oz of plastic, and exerts 25,000-psi injection pressures—*Lewis Welding & Engineering Corp, Machine Div, 22901 St Clair Ave, Cleveland 17, Ohio*



DUAL EXHAUST TAIL-PIPE SUPPORTS are assembled at Oldsmobile plant in Lansing, Mich on special pressure-sensitive hydraulic Multipress. Each assembly consists of two offset stamped arms with hole in each end, shaft with shoulders on each end, and bushing assembly consisting of rubber bushing secured in a metal container. In operation, unit makes use of an air cylinder to force a shouldered pin on a rubber bushing, while the 6-ton press simultaneously stakes both ends of the shaft to the offset arms—*Dension Engineering Co, 1160 Dublin Rd, Columbus 16, Ohio*

Portable resuscitator called Handy, for use in in-plant emergencies, automatically inhales and exhales for patient being treated and automatically adjusts to his lung capacity. As an aspirator, it furnishes sufficient suction to clear water, mucus, or vomitus from the throat; as an inhalator it supplies oxygen to be absorbed by spontaneous respiration. Unit is employed with standard masks, can be used 200 ft away from oxygen supply. Case accommodates two standard "D" oxygen cylinders.

National Cylinder Gas Co, 840 N Michigan Ave, Chicago 11, Ill



Dumore Drillpress Provides Instant Changeover for Tapping

Drill-N-Tap press is designed to provide instant changeover from drilling to tapping for long or short production runs. Drill bushings are simply removed when tapping is desired. Tap fits into the chuck, and no extra head is necessary. Self-reversing motor withdraws the tap by reversing spindle rotation; no clutches are needed.

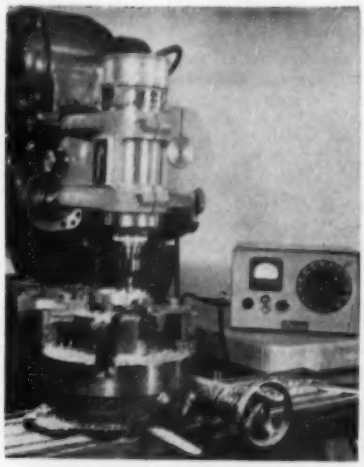
Both forward and retract air pressures on the two-way pneumatic system can be adjusted infinitely, so that tearing of top threads is prevented when tap is pulled from workpiece. Heads are quickly removable and can be inserted into other setups.

Press is provided with automatic head and complete fixture press with round or rectangular table. Hydraulic feed control and electronic cycling for deep-hole drilling are available as extra equipment.

Dumore Co, 1300 17th St, Racine, Wis

Liquid spring, Model S1064-6, is a self-contained device which includes a high-velocity liquid spring for use where great energy is required instantaneously. 90% of the ¾-in. stroke is a spring and the last 10% acts as a shock absorber to stop the piston without structural damage. Device develops 6400-lb spring action with a preload of 1000 lb, and provides 10 in.-lb of shock absorption as well as 200 in.-lb of high-velocity energy output with a total efficiency of 77%. Dimensions are 1¼-in. OD by 8 in. long.

Taylor Devices Inc, 188 Main St, North Tonawanda, NY



Heavy-Duty Power Quill Develops 1½ hp at Quill

Precise Super 80 power quill is a high-speed unit which develops 1½ hp at the quill and provides a continuously variable speed range from 7000 to 25,000 rpm. Electric speed control with a simple dial permits easy selection of the speed desired; control provides a voltmeter calibrated in rpm, master switch, pilot light, and a fusetron for overload protection.

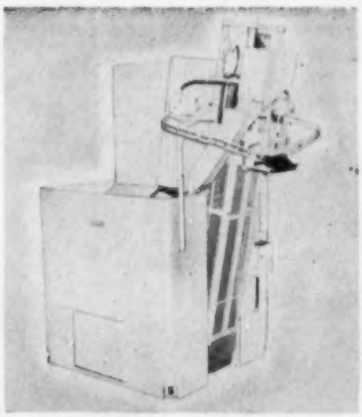
Standard equipment includes a precision collet chuck with ½-in. capacity. Also available is a solid quill extension accommodating wheels up to ½-in. ID and 2½-in. OD. Special mounts, either universal or plane-type, are offered to permit mounting unit to such machine tools as milling machines, tool and cutter grinders, lathes, and surface grinders.

High-speed universal motor, five grease-sealed precision ball bearings, and a rigid quill—all contained in a one-piece steel housing—permit milling, grinding, or finishing to tolerances of 0.0001 in. Built-in filtration unit protects bearings.

Precise Products Corp, Racine, Wis

Valve-reseating grinder trademarked Dexter can regrind any globe or gate valve from ¼ to 12 in. without removing valve from line. Through the use of a high-speed motor and abrasive-cloth grinding elements, tool reportedly can grind any valve regardless of material hardness. Grinding elements are made in form of cones and segments, are mounted on various size rubber-coated grinding heads. Tool is available in kit form in three basic models.

Leavitt Machine Co, 10 E River St, Orange, Mass

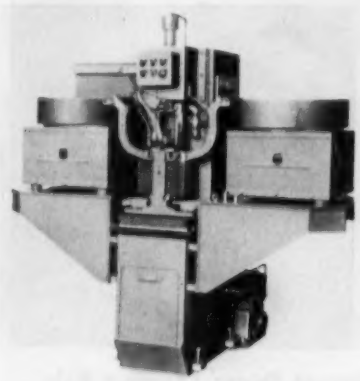


Feedall Automatic Feeder Has 45-cu-ft Hopper Capacity

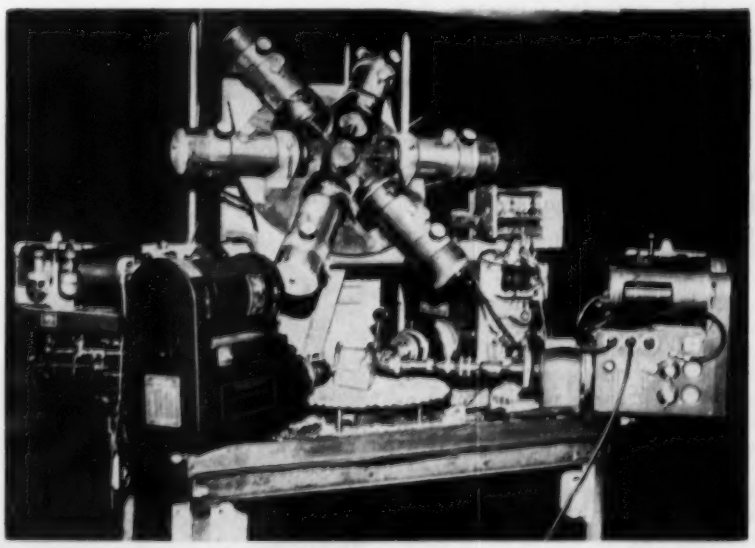
Model 2500B automatic feeder is equipped with large 45-cu-ft hopper which can serve as storage space or can feed parts through multiple chutes to production machines or assembly lines. Range of work for rolling parts is 5-in. dia by 3/16 to 1½ in. long. For sliding parts, range is 3/16 to 2 in. in dia and up to 5 in. long.

Power is furnished by a 1½-hp, 220/440-v, 3-phase motor operating through a variable-speed drive. In operation, parts are placed in hopper, are picked up by elevating conveyor, and discharged through multiple chutes.

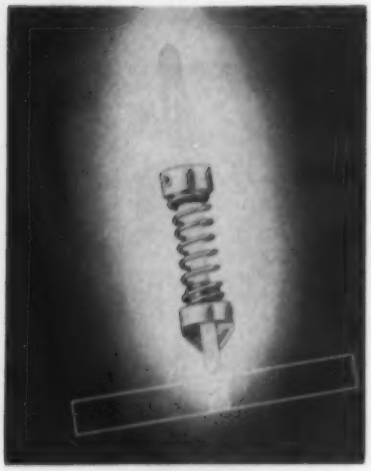
Feedall, Inc, Willoughby, Ohio



HYDRAULIC BROACHING PRESS of special design broaches a radius groove in both ends of two different-length pinion gear blanks at the rate of 2080 per hr. Automatic operation requires no operator. Blanks are loaded into hoppers on each side of machine, positioned in feed magazines by vibration, pushed through stationary broaches by twin pushers attached to hydraulic press ram, and unloaded into ejection chutes—*Detroit Broach & Machine Co., Dept 102, Rochester, Mich*



ZINC DIE CASTINGS are machined on special set-up which consists of ten standard units. Rate of production is 260 to 300 per hr. Two Series 24 automatic drill units, mounted on worktable and equipped with Tru-Arc tool attachments, recess both ends of castings at same time; two Series 28 Drill-N-Tap units then tap both ends; operator then places work on fixture above table, consisting of six Series 20 automatic drill heads, which drill six 3/32-in. holes in work simultaneously—*Dumore Co, 1300 17th St, Racine, Wis*



Vernon Device Chamfers Hole During Tapping Operation

Chamfering of a tapped hole as a separate operation is eliminated by device called Burr-Bit, which accomplishes the operation while tapping. Device is slipped over tap and tightened; it operates while the tap is being withdrawn, shaving off raised thread or burr and creating a clean hole.

Made of HSS tool steel, product has a special setscrew running inside tap flute which does the driving. It is reported to work well on thin metals and on all materials, including steel, cast-iron, aluminum, and plastics. It will fit all two-and four-fluted taps from No. 2 to 5/16 in. in all pitches.

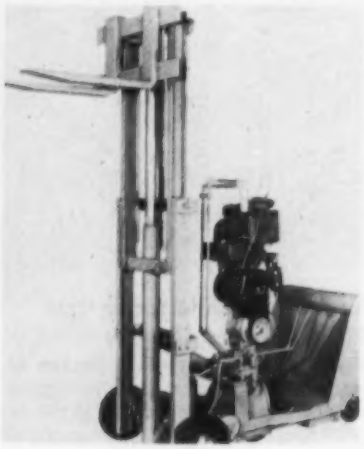
Vernon Devices Co, 8 Wilson Pl, Mt Vernon, NY

Warner Electromagnetic Clutches Eliminate Reversing Motor

Development by Warner Electric Brake & Clutch Co for Ettco Tool Co leadscrew tapping unit makes it possible for machine to tap four holes to different depths, reverse, and back out the taps, all without attention from operator. Unit is driven by a motor which runs continuously in one direction, so that no reversing motor is needed.

Key to system is the use of fractional-horsepower forward and reverse clutches. Torque output of clutches can be varied by a rheostat control, providing the sensitivity needed for small taps as well as the power to drive large taps. Because actuating force (electric current) is the same as motive force (magnetic flux), engagement and release of the clutches is instantaneous; clutches can be controlled to operated within milliseconds. This type of driving force eliminates any end pressure on the leadscrew or taps.

Warner Electric Brake & Clutch Co, Beloit, Wis



1500-lb Lift Truck Stacks in 103-in. Aisles

Model D-15, gasoline-operated, is designed for tight working areas, pivots 360°. Six-wheel unit has turret-mounted air-cooled engine.

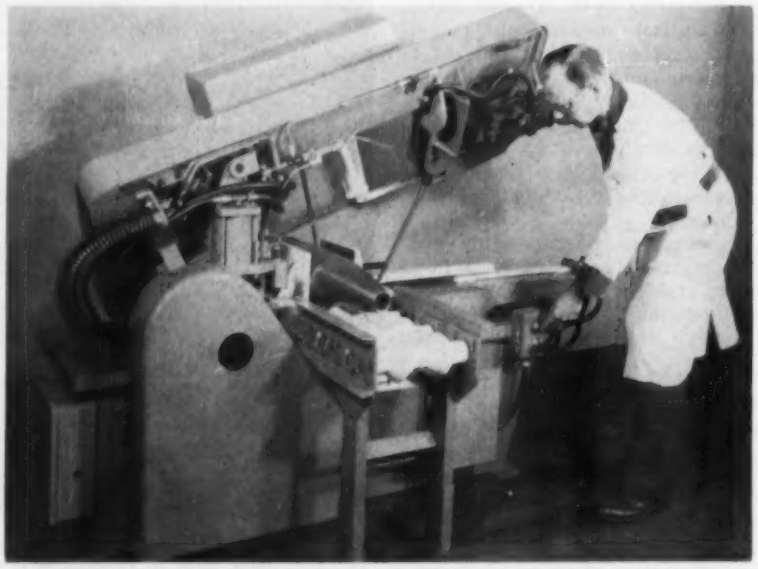
Specifications: lift, 84 in.; over-all length without forks, 64 in.; width, 35 in.; wheel base, 54 in.; mast tilt, 10° back, 3° forward; turning radius. 64 in.; overall height, mast lowered, 66 in.

Knickerbocker Co, Truck-Man Div, 537 Liberty St, Jackson, Mich

MASTER FEED FINGERS for use on multiple-spindle screw machines can be adjusted at the machine. Nose cap can be easily removed and tension of finger loosened or tightened rapidly—*Green Manufacturing Co, 122 S Prairie Ave, Rockton, Ill*

Variable-length cutoff control, Model 30A, provides length control of strips, tapes, and sheets of all types. Transmission input is connected to a conveyor head shaft or machine shaft that controls rate of feed of material; cam mounted on the output shaft trips a limit switch or valve which controls the cutoff knife. Length control is obtainable anywhere from fraction of an inch to several hundred feet. Remote mechanical or electrical controls can be provided.

Graham Transmissions, Inc, Menomonee Falls, Wis



ARTILLERY-SHELL BOSSES are trimmed on modified version of Model C-57 power saw at a rate of 15 sec per shell, exclusive of load and unload time. Steel shells are 8 in. in dia, weigh 250 lb, and have Brinell hardness of 300 to 325. Controls for initiating sawing cycle are provided at rear of machine as well as on control panel. Rapid-head approach is provided to save time—*DoAll Co, 254 N Laurel Ave, Des Plaines, Ill*

REVERE COPPER EXTRUSION shown attached to skirtboard before full assembly, which you can see below in exploded view. A matching bar, similar to the one shown is part of the "packaged" HANCO unit and is fastened to the opposite side of the screen. Units, in turn, are installed on the various types of Vibrating Screens made by HEWITT-ROBINS INC., Passaic, N. J., and are known as the HEWITT-ROBINS HANNON Electric Screen Heaters.

CLOSE-UP showing end of the Revere Copper Extrusion.

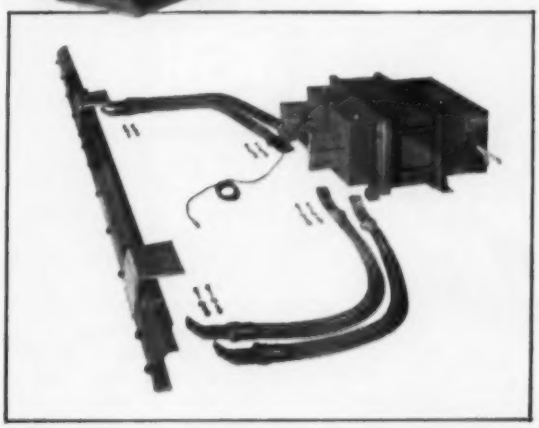
Revere Copper Extruded Shape

in Hanco Electric Screen Heater

out-performs

former copper casting

on 4 counts



"Customers of F. R. Hannon & Sons are now assured of many years of maintenance-free performance plus improved products."

Says T. W. HANNON, *Vice-President, General Manager*
F. R. HANNON & SONS, Canton, Ohio

Mr. Hannon continued, "For a number of years we had experimented with many different types of materials which would be non-porous, free from any burrs or voids, capable of maintaining a straight leading edge and able to carry 1500 amperes at 5 volts. The Revere Copper Extrusion meets these requirements. And for the rugged use to which our machines are put it would be virtually impossible to maintain satisfactory operating results without the use of this extruded electrical conductor."

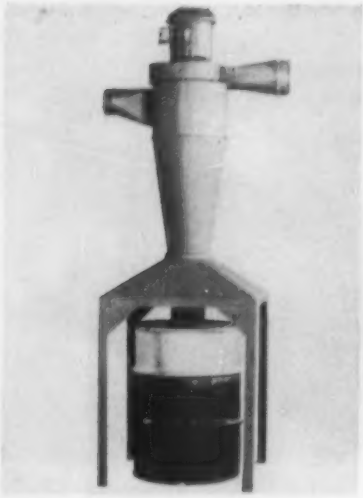
Perhaps there is a Revere Product that can help you give *your* customers a superior product, or help cut your production costs. You'll never know until you call the Revere Office nearest you and ask to have a T. A. (Technical Advisor) call. Why not make that call today?

Here's the Score!

COPPER EXTRUDED SHAPE	COPPER CASTING
1—12 foot mill lengths offer flexibility, eliminating both welds and scrap	1—60" casting required additional welded joints
2—Shape offers lack of porosity	2—Casting gave porosity problem
3—Shape straightness is superior to casting, giving better electrical contact	3—Bow in casting presented difficulty when fastening screen firmly to contact
4—Higher cost per foot, but cheaper over-all installation	4—Initial cost was lower, but additional welds and scrap resulted in higher final cost, and an inferior finished product

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.
Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

COPPER * BRASS * 18 01 * REVERE * ALUMINUM



Torit Dust Collector Exhausts 1100 cu ft of Air Per Min

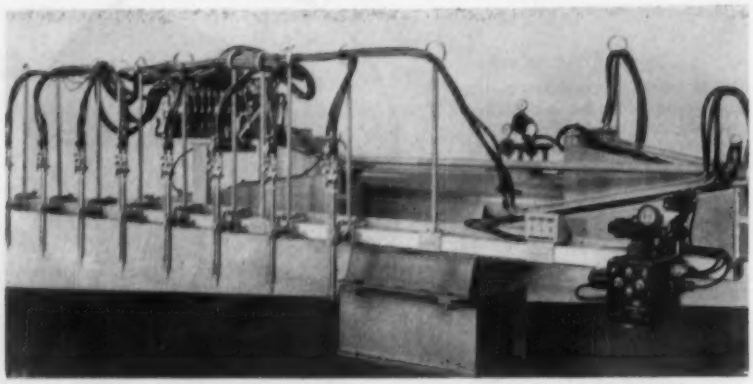
Line of cyclone dust collectors known as Series 55 is designed for connection to 55-gal drums. Exhausting capacities range from 1000 to 1100 cu ft of air per min at speeds in excess of a mile per min. Collectors feed directly into drums, which can be quickly removed and replaced when full.

Units use centrifugal force to precipitate all but the finest dust particles, which are exhausted outside or trapped in an after-filter bag. Collectors stand on four-legged frame and have an airtight flexible shield that connects to top of drum. Everything is furnished except the drum, at factory prices ranging from $375 to $448.

Other specifications: height, 104 in.; motor, 2 hp-3450 rpm; inlet dia, 6 in.; outlet dia, 8 in.

Torit Mfg Co, Dept KP, 287 Walnut St, St Paul 2, Minn

ADJUSTABLE VISE STOP makes it possible to machine many pieces rapidly, to the same dimension, after the machine is set for the first piece. Maker reports that 0.0002-in. tolerances have been held on hole location with the hardened stop, which retails for $2.95. One ¼-20 tapped hole will attach stop to any vise—*Glover Mfg Co, 736 Mohican Pl, Meadville, Penna*



GAS SHAPE-CUTTING MACHINE, Airco No. 56 Oxygraph, is designed to carry such automatic cutting equipment as motorized cutting-torch holders solenoid gas-distribution system, and electronic tracer—all remotely controlled. Machine is of stationary type with a fixed cutting area (56-in.-dia circle), but can be converted to larger-area unlimited-length machine by addition of rails and traveling carriage. Basic machine consists of pantograph arms, operating bar upon which torches and tracer are mounted, and a welded pedestal—*Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42nd St, New York 17, NY*

HEAVY-DUTY HAND TRUCKS have 10 x 2½-in. semi-pneumatic wheels, 12 x 14-in. noseplates, handle loads up to 600 lb. Models are available with twin handles, push-pull, or down-frame twin style. Catalog 453—*Milwaukee Truck Co, 250 North 12th St, Milwaukee, Wis*

Pangborn Barrel-Cleaning System Provides Automatic Cycle

Designed for large-volume cleaning and descaling of parts, Blastmaster Barrel will automatically handle and weigh parts, as well as start and stop rotation of the barrel. Several machines can be grouped in a line, receiving dirty castings from a conveyor which feeds the loading skip at each unit. After the cleaning cycle, one common conveyor serving all barrels in the group can take clean parts to the next operation.

All controls on machine are electrical. All phases of the cleaning cycle can be controlled separately and manually, if required. Barrel can be furnished in sizes of 6, 12, 18, and 27 cu ft.

Pangborn Corp, Hagerstown, Md

Magnetostrictive Transducer for Large-Scale Operations

Model AM-203B high-power magnetostrictive transducer, used with mating stainless-steel jar or mounted externally on a tank or trough, is intended for use in large-scale ultrasonic cleaning, degreasing, descaling, plating, and other metalworking and finishing operations. Average rf power applied to transducer is 66 watts/sq in. of radiating area. Only the Teflon face, which is impervious to solvents, most strong acids and most alkalis, is in contact with solution.

Unit is 4⅝ in. high, has a 4⅜-in. diameter. Each unit features built-in biasing magnets and eliminates need for separate dc bias supplies and isolation networks. Maximum magnetostrictive stack motion is obtained through use of a closed magnetic-path core construction that minimizes leakage inductance.

400-watt, 25.9 kc transducer can be group externally on existing equipment and driven in tandem by matching above-audible frequency generators ranging in power from 400 to 10,000 watts and above. It can be used with liquids at temperatures far above boil point.

Acoustica Associates, Inc, Glenwood Landing, LI, NY

SIDNEY

THE SIDNEY MACHINE TOOL CO. SIDNEY OHIO U.S.A.

LATHES

outstanding in 3 great requirements

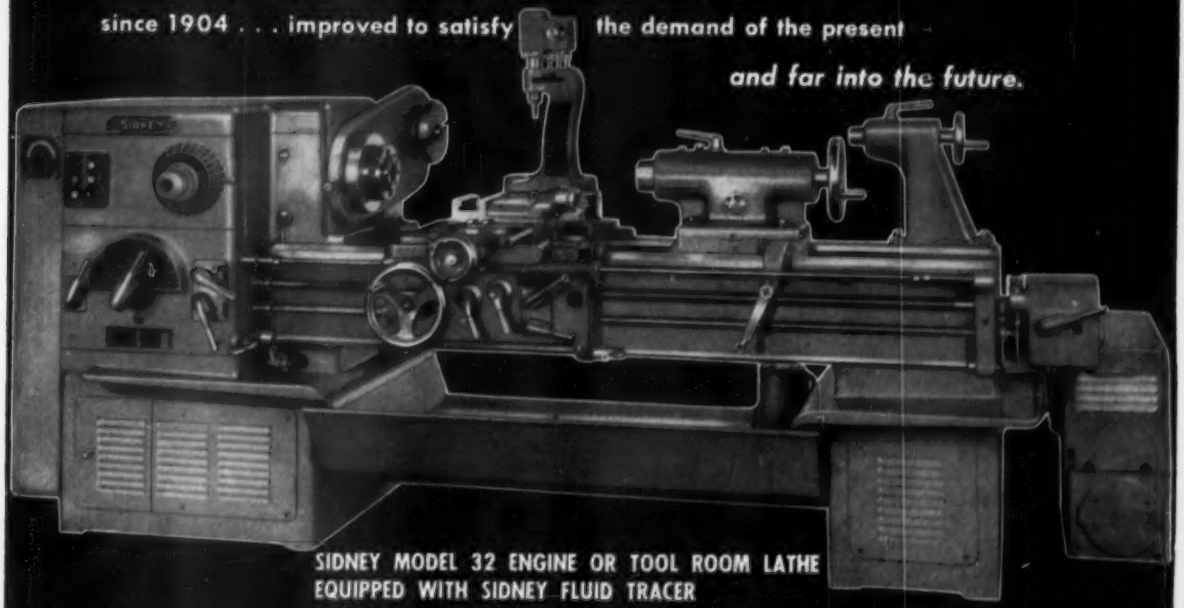
which are indispensable in furnishing amazing speeds on work of utmost precision . . . *LOWEST COST PER PIECE.*

① GREATER RIGIDITY

② SIMPLICITY of CONTROL and OPERATOR CONVENIENCE

③ PRODUCTIVITY

NEW . . . PRACTICAL . . . DEPENDABLE . . . DESIGNED to do MORE for you at LESS COST. Built on the fundamental SIDNEY principles which have won international fame since 1904 . . . improved to satisfy the demand of the present *and far into the future.*



SIDNEY MODEL 32 ENGINE OR TOOL ROOM LATHE EQUIPPED WITH SIDNEY FLUID TRACER

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904

Fauver Conveyor Lubricator Incorporates Improvements

Redesigned Series 100 conveyor lubricator includes four fundamental improvements: mechanism is completely inclosed in a non-porous aluminum housing; improved crown filters and regulators are standard equipment; redesigned trip mechanism actuates a Hunt valve through a cam; and provision has been made for easy removal and replacement.

Series consists of three types of oil lubricators: lubricators for trolleys and chains, for bearings on slat-type conveyors, and for hot-zone applications. Eight models are included in series.

J N Fauver Co, Inc, 51 W Hancock, Detroit 1, Mich

Epoxy-Resin Adhesives Cure At Room Temperature

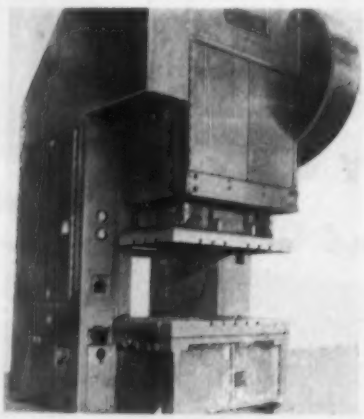
Three epoxy-resin adhesives that cure at room temperature and under contact pressure to a strong solid state without forming volatile by-produced have been announced. All can be used for bonding aluminum, brass, copper, steel, and other metals to each other, to glass, and to many plastics. They are each cured with different activators to form adhesives that have 100% solids content.

EC-1294 adhesive cures to a clear, hard, light-amber material said to have good machining properties. Typical uses include the permanent positioning of metal and plastic sleeves, bushings, and inserts.

EC-1474 adhesive is a lower-cost formula having many of the properties of EC-1294. Designed for use where cost is a major factor and high shear strengths and light color are not necessary, adhesive bonds aluminum, steel, brass, and other metals to themselves and to many plastics.

EC-1472 adhesive can be used where good flexibility, together with shock and peel resistance, is desired. Tests indicate shear strengths of 3430 psi at room temperature and 2030 psi at −65 F. Adhesive should not be used where temperatures above 120 F are encountered.

Minnesota Mining & Mfg Co, Adhesives & Coatings Div, 411 Piquette Ave, Detroit 2, Mich

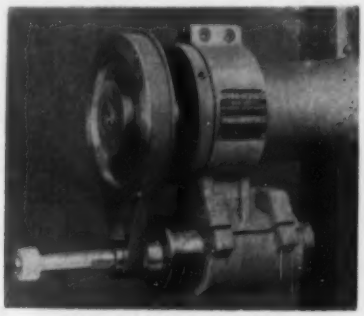


New Verson Gap Press Is Totally Enclosed Unit

Piping and wiring of all air, lubrication, and electrical components as well as gears, flywheel, clutch, and all other moving parts are fully enclosed in this new model.

Die space area is well lighted for working convenience; receptacles and pockets for safety blocks prevent press from operating while men are working in danger areas. Power for portable electric-service tools is provided by 440 and 110-v service outlets. Exact position of ram at any point in the stroke is shown by electric indicator. Complete electrical control system includes extra outlets and cams for tying unit into automation lines and for automatically operating ejector-type dyes.

Verson Allsteel Press Co, 9300 S Kenwood Ave, Chicago, Ill

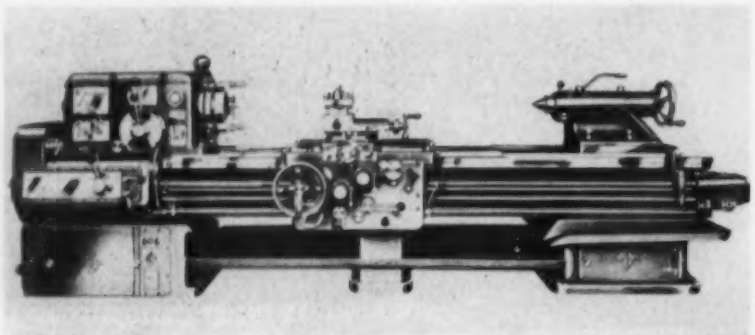


High-Speed Grinding Attachment Processes Hard-to-Reach Spots

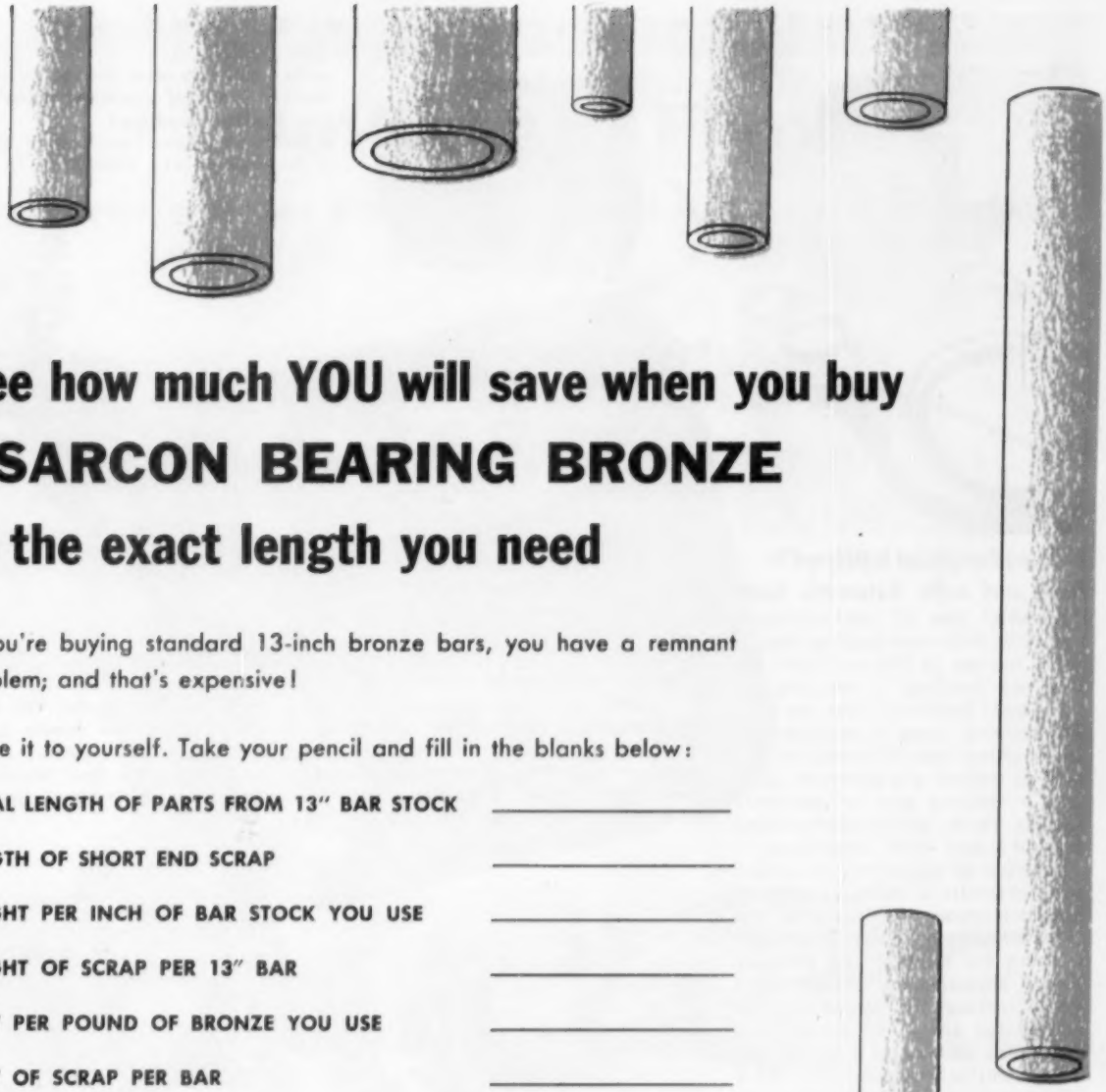
Attachment to be used with surface grinders is designed for angles or slots too small to permit use of standard size wheels, for grinding serrations, T-slot, and similar surfaces. It can also be used for grinding small radii and contours in die blocks.

Unit mounts on surface grinder spindle, provides 14,000-rpm spindle speed. Belt tension is adjusted through use of eccentric bushing.

Boyar-Schultz Corp, 2000 South 25th Ave, Broadview, Ill



HIGH-SPEED LATHE, made in Sweden by Koping, is designated Type S-12-A. Machine has max swing over bed of 24 in., 18 spindle speeds from 11.4 to 950 rpm, and is available in four modifications of 60, 80, 100, and 120-in. distance between centers. Extra equipment offered includes taper-turning attachment, profiling attachment, and quick power traverse to carriage—*Imported by Homestrand, Inc, 9 Addison St, Larchmont, NY*



See how much YOU will save when you buy ASARCON BEARING BRONZE in the exact length you need

If you're buying standard 13-inch bronze bars, you have a remnant problem; and that's expensive!

Prove it to yourself. Take your pencil and fill in the blanks below:

TOTAL LENGTH OF PARTS FROM 13" BAR STOCK _____

LENGTH OF SHORT END SCRAP _____

WEIGHT PER INCH OF BAR STOCK YOU USE _____

WEIGHT OF SCRAP PER 13" BAR _____

COST PER POUND OF BRONZE YOU USE _____

COST OF SCRAP PER BAR _____

Now multiply the cost of your scrap by the numbers of bars you use per month and you can see how much short-end scrap is costing you.

If you want to save this money, buy Asarcon Bronze rods, tubes and shapes in exactly the length you need up to 105"; and in any diameter up to 9". Talk to your nearby Asarcon distributor, or write to us directly. We'll be happy to show you how other companies are turning bronze scrap-end losses into profits.

Continuous-Cast Products Department

AMERICAN SMELTING AND REFINING COMPANY

Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana
WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna Street, San Francisco
IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal

ASARCO

Welding Equipment Is Offered In Semi- and Fully Automatic Units

"Surewelt" line of semi-automatic and fully automatic welding equipment, for use in CO_2 and inert-gas metal-arc welding, is designed for single-pass horizontal and flat-position welding, using a constant-voltage dc power source. It consists of a welding control and electrode drive unit, a welding gun or automatic welding torch, and interconnecting gas and water cable assemblies.

Function of equipment in a consumable-electrode welding system is to feed electrode into arc at a constant, pre-selected speed. It provides a means for starting and stopping the arc, adjusting the electrode feed speed, inching the electrode, controlling the arc-welder power, and controlling the flow of shielding gas.

Four outfits are available: SA-1 (illustrated) is for semi-automatic welding using a welding gun. SA-10 outfit is for fully automatic operation where electrode torch is positioned on a light carriage mechanism, and where welds are of relatively short length. SA-20 is for use in automatic welding of long joints where work is moved or rotated under a stationary welding position, or where head is mounted to a travel carriage device. SA-30 is combination outfit which can be used for semi-automatic and automatic welding, as well as for arc-spot and plug welding.

National Cylinder Gas Co, 840 N Michigan Ave, Chicago 11, Ill

Solid-carbide end mills are offered in series which includes standard diameter sizes of 1/8, 3/16, 1/4, 3/8, 1/2, 5/8, and 3/4 in. Bulletin No. 165.

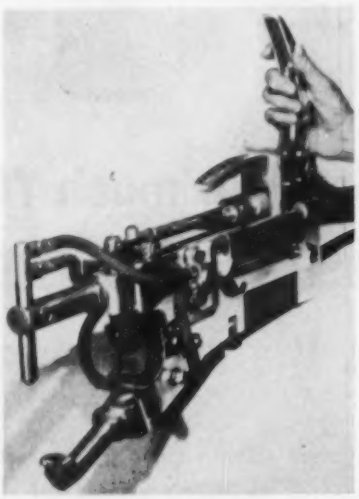
Severance Tool Industries, Inc, 726 Iowa St, Saginaw, Mich

Proximity Transducer Systems Detect Presence of Metals

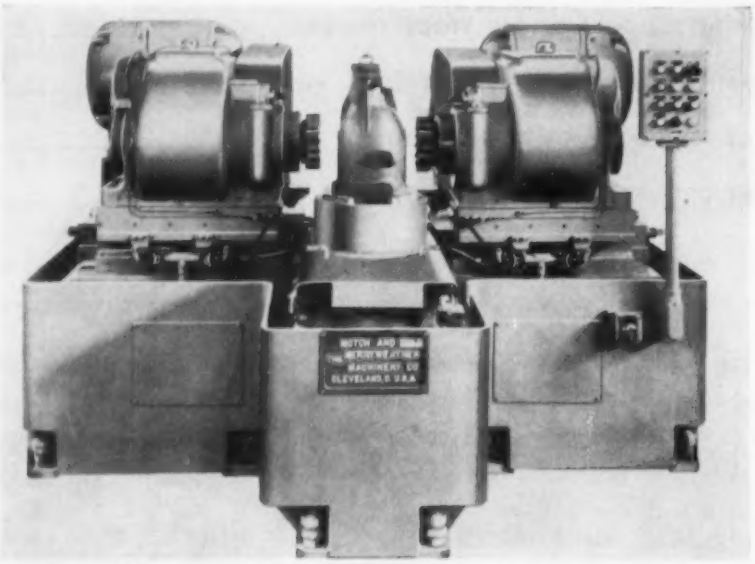
Series 4950 high-frequency proximity transducer systems are said to be capable of detecting the presence of metal objects at twice the maximum ranges of company's previously announced 4900 system. Series employs principle used in military mine detectors to sense presence of metal objects without contact for counting, controlling motors or valves, and actuating warning devices.

Metal objects can be sensed up to 3/4 in. away through such non-metallic substances as plastic, paper, pasteboard, or wood at rates up to 1000 units per sec. Two models are offered: one is used primarily with electronic equipment, other contains a mercury relay for controlling various kinds of electrical machinery. Bulletin is offered.

Electro Products Laboratories, 4500 N Ravenswood Ave, Chicago 40, Ill



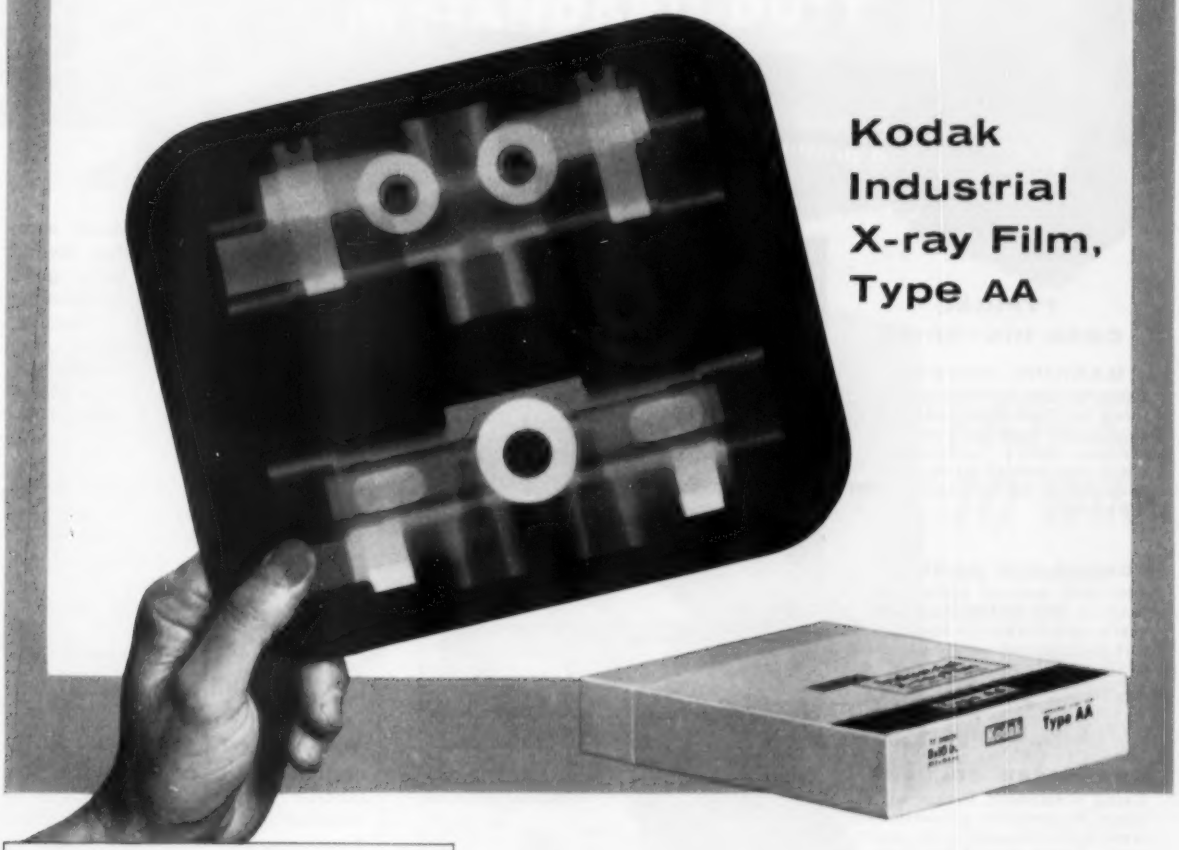
ARO SPOT WELDER Model 192 incorporates a lever that lowers and raises the bottom arm—*Guthery Machine Tool Corp, Aro Spot Welders Div, 38-31 Crescent St, Long Island City 1, N Y*



TRANSMISSION HOUSINGS are milled, two sides each simultaneously, by opposed milling heads on hydraulically actuated machine. Work is located on large-end surface through locating holes. At first pass two bosses are milled on two sides. For second pass and the milling of bearing surfaces on each side, locating fixture turns 90° and drops work about 1 in. to clear projecting lugs from path of cutters; in this position, cutters not only mill bearing surfaces, but also machine top surfaces of lugs. All movements are automatic; milling heads are universal, with changeable speeds and 2-in. quill adjustment—*Motch & Merryweather Machinery Co, 888 E 70th St, Cleveland 3, Ohio*

New X-ray Film

gives greater detail with usual exposure times



Kodak Industrial X-ray Film, Type AA

Read what the new Kodak Industrial X-ray Film, Type AA, will do for you.

- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under shop conditions of use.

Now your x-ray dealer can supply you with this new x-ray film that gives you greatly increased speed. This gives you the opportunity of using reduced kilovoltage to obtain greater radiographic contrast, and easier readability with established exposure times.

And in addition to ranging up to more than double the speed, this new film retains the fine sensitivity characteristics which have made Kodak Type A the most widely used x-ray film in industry.

Kodak Industrial X-ray Film, Type AA, will save you time. It can produce finer work. Get in touch with your x-ray dealer or Kodak Technical Representative and see how.

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N. Y.

Kodak

PRECISION...
UNIFORMITY...
FLEXIBILITY...

Mark 1000 or more units per hour on an infinite variety of surfaces, flat, round or curved—with absolute uniformity of depth of impression throughout longest production runs.

...PARKER #710 makes marking a production line operation

TYPICAL CASE HISTORIES

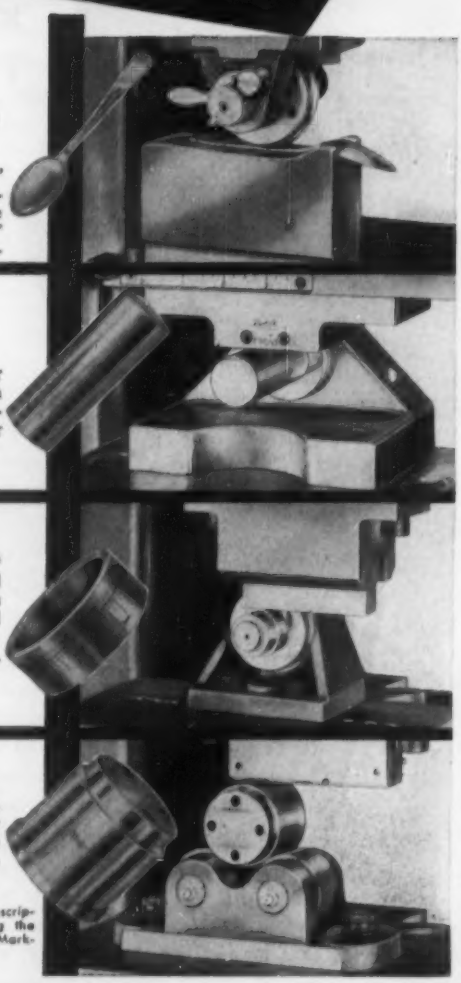
MARKING SPOONS
Using Parker #100 "standard" insert roll die holder and interchangeable segment type. The machine table's "cushioning" effect, plus proper set-up, compensated for the curvature of the spoon.

CAPACITOR SHELLS
800-1000 marked pieces per hour on thin walled aluminum shells with Parker tooling, custom built for use on the Parker #710.

GRADUATED COLLARS
Using a standard Parker stud arbor, the precision graduations were easily indented in this steel collar. Depth of mark was closely held to specified tolerances.

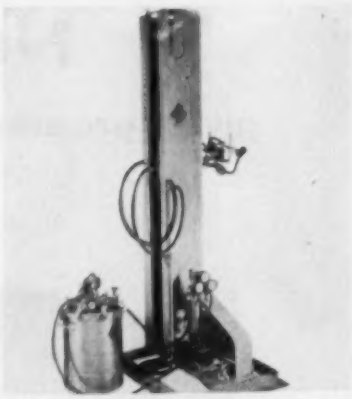
SOLID ROUNDS
Marking part numbers and other legends on the outer diameter of solid rounds is no problem. Standard Parker roller bearing cradles are used on this production run.

SEND TODAY for new descriptive literature describing the Parker #710 Hydraulic Marking Machine.



THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT
by Parker

NEW SHOP EQUIPMENT



VERTICAL OSCILLATOR permits automatic spraying of flat pieces carried on overhead conveyors. Spray guns, carried up and down on ball-bearing carriage, are controlled by adjustable, cam-operated valves to cut off spray at end of each stroke—*Paasche Airbrush Co, Div of Cline Electric Manufacturing Co, 1909 W Diversey Parkway, Chicago 14, Ill*

Portable foot warmer called Electro-Mat is an electrically heated, neoprene-rubber mat for protection of operator's feet in conditions of extreme cold. Mat is 14 x 21 in. in size, operates on ac or dc. It retails at $7.95.

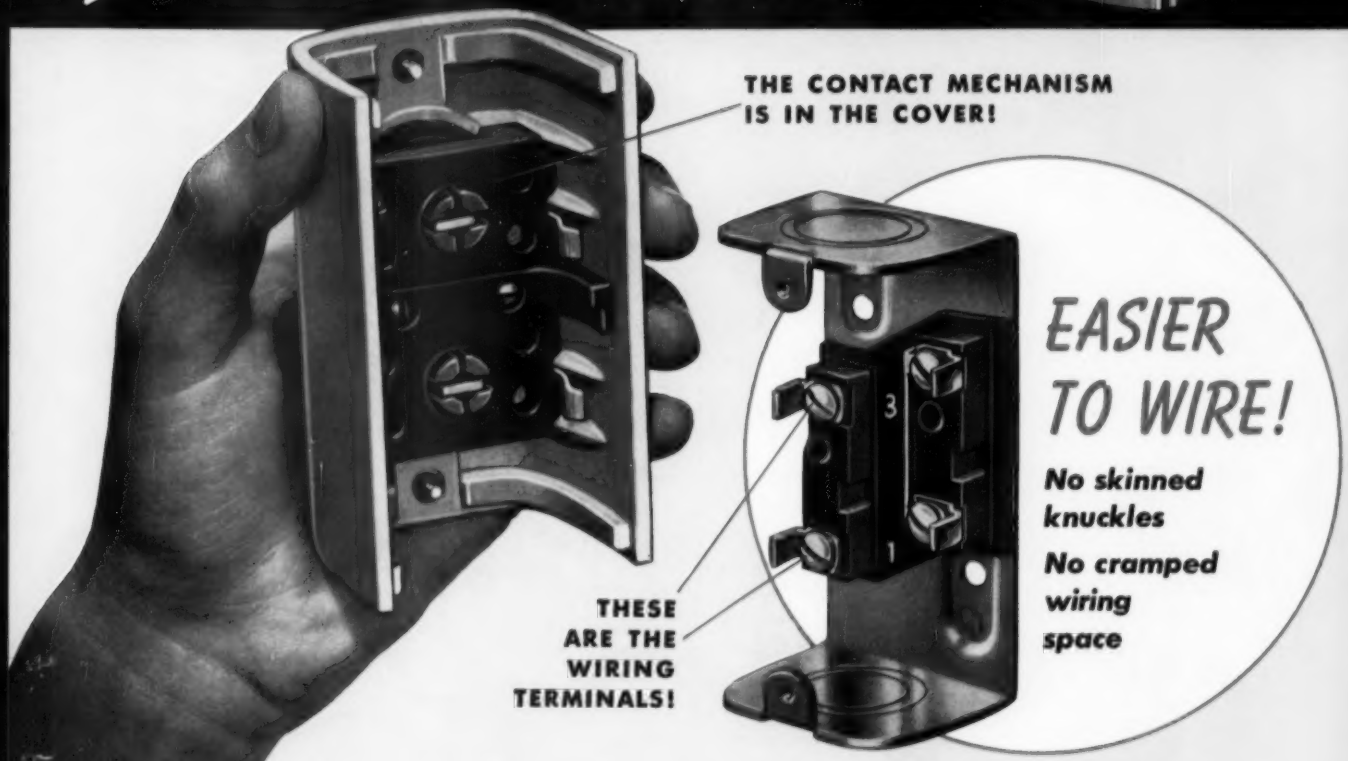
Interstate Rubber Products Corp, Dept R8, 908 Avila St, Los Angeles 12, Calif

Air-operated tape dispenser for industrial use is available in four automatic models which eliminate pushbuttons, levers, and foot pedals. When operator removes a length of tape, a micro switch automatically sets in motion the next delivery cycle. Unit is available for all types of pressure-sensitive tape in widths up to 4 in., lengths to 21 in. Tapes handled include plastic, glass fiber, cloth, heavy paper, and cellulose.

Air Fixtures, Inc, 202 W Main St, North Manchester, Ind

Counterbalance cylinders for punch-presses in Model L Series can be installed by tie-rod, flange, side-base, or pivot mounting. Devices are available in standard bores of 5, 6, and 8 in., all with 16-in. stroke; larger bores and strokes are available at extra cost. Cylinders are said to eliminate ram drop due to its own weight or weight of attached tools; eliminate brake wear caused by excessive brake pressure sometimes necessary to keep the ram

Brand New Idea in STANDARD-DUTY STATIONS



Here's an entirely new idea in push button stations—a wrap-around cover—with the contact mechanism part of the cover. Removing the cover exposes the terminals for instant and easy wiring. Strong, spring type, silver plated contacts connect the push button assembly in the cover with the terminals in the base.

Matching ribs in the cover and notches in the terminal blocks assure that the wiring connections are always correctly made. A bakelite shield protects the contact mechanism and prevents careless wiring from interfering with the contact operation. Concentric knockouts are provided in both top and bottom of the heavy metal base.

You will want to know about this new standard-duty station because—it is good looking—it takes less time to install—it was designed for the convenience of the installation engineer.

Let us show you a sample of this "brand new idea" in standard-duty stations!

A-B Quality

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

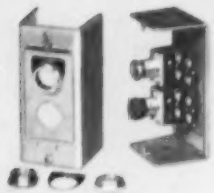
Bulletin 800 standard-duty push button stations can be supplied with one, two, or three buttons, or as a selector switch. Also available with pilot light. Furnished only in NEMA Type 1 enclosures.

9-56-MR

Also... ***NEW*** **HEAVY-DUTY PUSH BUTTONS**

BULLETIN 800

NEW FLEXIBILITY!



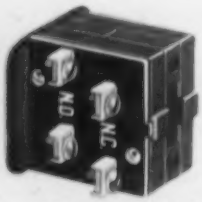
You can assemble any special heavy-duty station from a small stock of standard push button, selector switch, and pilot light components. There is no need to wait for long delivery of your special stations.

Stations can be arranged for either vertical or horizontal mounting. Name plates can be rotated to any position, replaced with any standard marking, or removed entirely.

NEW ENCLOSURES!

Each button, selector switch, or pilot light is a self-contained unit which can be mounted in attractive new enclosures. Standard enclosures accommodate up to eight units, but enclosures can be furnished for larger numbers.

NEW CONTACT BLOCK!

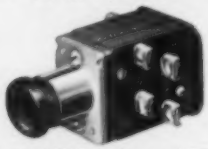


Above: View of contact block, showing terminals for normally open and normally closed contacts. Right: Contact block, with cover removed, showing stationary silver alloy contacts and pushrod carrying the moving contacts.

Bulletin 800 heavy-duty push buttons have the same molded contact blocks that have proved so dependable in Bulletin 800T oiltight push buttons, although they are not themselves oiltight. And all of them are equipped with double break, silver alloy contacts.

NEW OPERATORS!

Operators, which mount on the contact block, are available in many types, and push buttons come in various colors.



Type AK2B flush head START button

Type DK6A mushroom head button

Type PK16 pilot light with transformer

Type EK11B cylinder lock unit

9-56-MR

A-B Quality

ALLEN-BRADLEY

QUALITY MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

from falling; eliminate over-riding of ram at mid-stroke when an unusually heavy tool is fastened to ram; and eliminate snap-through and back-lash.

Dayton Rogers Mfg Co, 2824 13th Ave S, Minneapolis 7, Minn

Threaded end welding studs, Type CP, are said to have 13% greater tensile strength than the former standard MG units, provide improved welding qualities. Same templets now used with MG studs can be used with CP's up to and including ½-in.dia, as ceramic ferrules have identical ODs.

Nelson Stud Welding Div, Gregory Industries, Inc, Lorain, Ohio

Spot weld elastic sealer compound, called Parweld, said to eliminate electrode failure caused by formation of copper oxide occurring when tip contacts ordinary compounds. Increase of service life by 500% is reported by company. Satisfactory welds are made with spot welder set to standard conditions of 10,000 amp, 10 c.

Parr Paint & Color Co, 18312 Syracuse Ave, Cleveland 10, Ohio

Dyeline inspection process locates cracks, fractures, cold shuts, tiny surface fissures, porosity, and imperfect welds on iron, steel, brass, aluminum, porcelain, plastics, and ceramics. Thin coat of Dyeline Dye is sprayed on, followed with Dyeline Detector; cracks as small as 0.002 in. wide are revealed in two minutes dwelling time.

Zip Abrasive Co, 1360 W 9th St, Cleveland 13, Ohio

120 diametral pitch gears in 14½ and 20° pressure angles have been added to Dynaco line of precision stock gears. Hub-type gears are available offering 20 through 120 teeth in 303 stainless steel and 61 through 120 teeth in 24 ST aluminum with bores ranging from 0.1200 to 0.1875 in. Gears are stocked in Precision Classes I and II.

Dynamic Gear Co, Inc, Amityville, NY

Detachable abrasive strip permits use of lightweight aluminum grinding wheels, either flat or grooved. Strip, consisting of abrasives set vertically in heat-resistant plastic on a fiber base, is designed to eliminate expensive replacement of heavy

(Continued on page 205)

Photo courtesy of Caterpillar Tractor Co., Peoria, Ill.

it's only part of the HTM* story...

STRENGTH

High ultimate strength of HTM castings helps the famous Cat D7 Tractor do the tough jobs day-in and day-out. Vital parts, such as the front idler adjusting nut shown, are made from HTM metal . . . the metal with the high ultimate strength that resists wear and fatigue under heavy loads.

And there are lots of other "plus" advantages in HTM castings. For example, they possess excellent non-seizing properties . . . can be either liquid or air-quenched . . . can be given a smooth finish. Perhaps *most important of all, HTM machinability index ranges from 80 to 90 (B1112 steel = 100).*

HTM castings can often reduce manufacturing costs, weight and assembly time . . . can increase quality and sales potential of *your* product. AA-5146-A

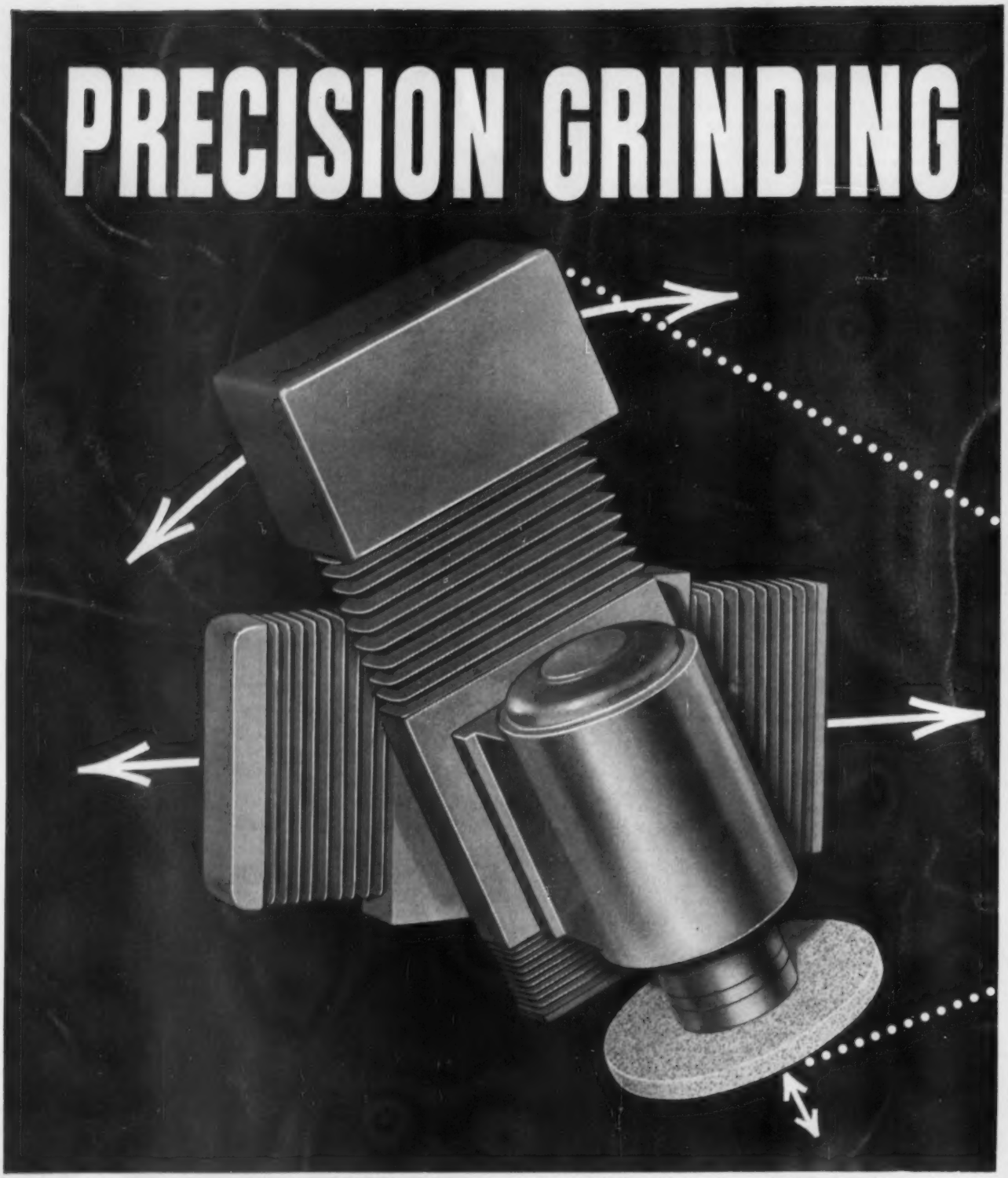
*HTM—*High Tensile (Heat-Treated) Malleable*

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

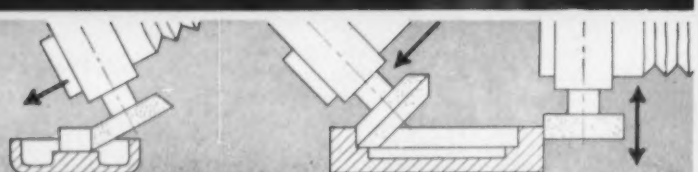
Established 1868 • Cleveland 6, Ohio

the nation's largest independent producer of malleable and pearlitic malleable

PRECISION GRINDING



Diagrams show typical applications of Frauenthal Standard Slide Units to a variety of grinding problems.



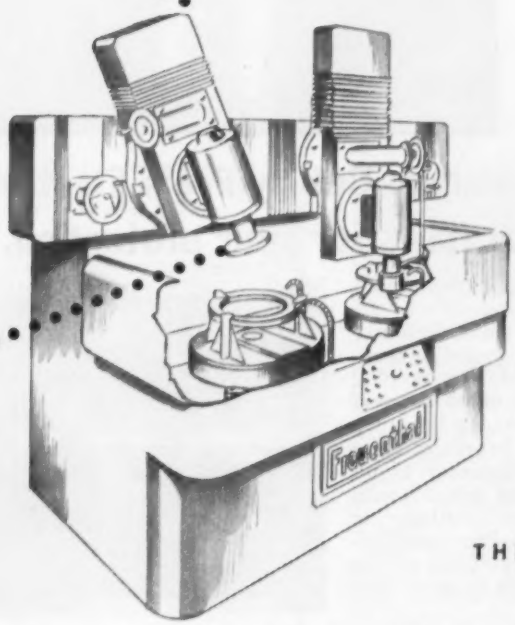
at any angle!

Frauenthal's creative engineering Now makes available Standard Slide Units in any number of combinations for production grinding applications . . .

IT IS NO LONGER NECESSARY to absorb special engineering and design costs when Frauenthal Standard Slide Units — plus a variety of grinding spindles — can be assembled to machine bases appropriate to a particular job. And these standard slides in single or multiple units can be arranged in an infinite number of spindle positions to accommodate an endless variety of simultaneous or sequenced, automatically controlled grinding operations.

What's more, you get all the advantages of Frauenthal's advanced engineering and design experience—proven on single and multiple-head grinders used on special production jobs. For example: parts for jet engines, diesel and automobile engines, tanks, gun mounts, radar units, large and small diameter precision bearings and machine tool components.

As illustrated here, this model of the versatile grinding compound shows how the Frauenthal Standard Slide Unit can be adapted to approach the work from any desired angle.

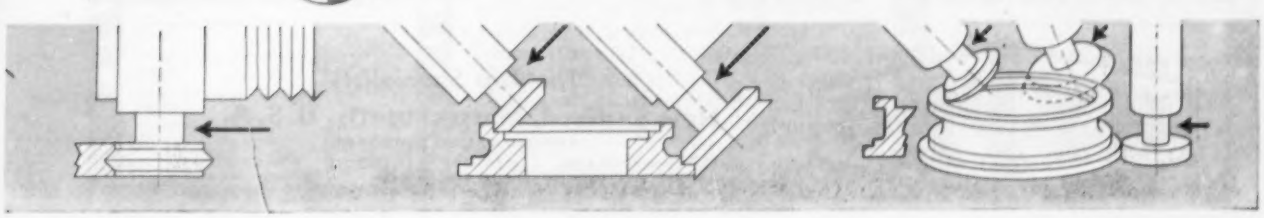


Here's a typical Frauenthal Double Head Vertical Spindle application utilizing two of the Frauenthal Standard Slide Units shown on the opposite page. Although applied to a particular grinding situation, these slide units retain versatility for angular positioning. Frequently, as indicated in panels 2 and 4 at the bottom of the page, diameters and adjacent surfaces are ground at one time with a single wheel dressed to the proper contour.

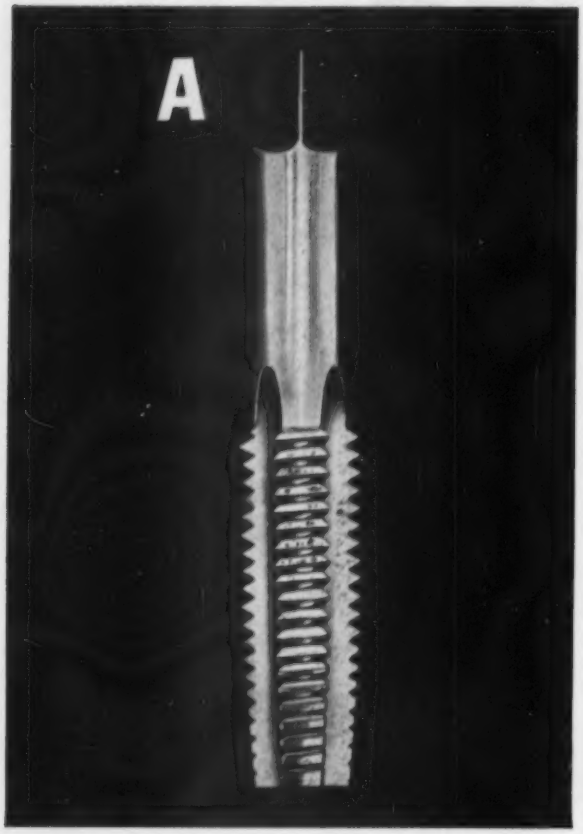
Send a print of your "problem grinding part" and our engineers will show you how to apply Frauenthal Standard Slide Units to solve the problem. Include in your letter pertinent production information — number of pieces, etc. Be sure to investigate the latest Frauenthal Vertical Grinders with Standard Slide Units. For complete details, contact Frauenthal of Muskegon.

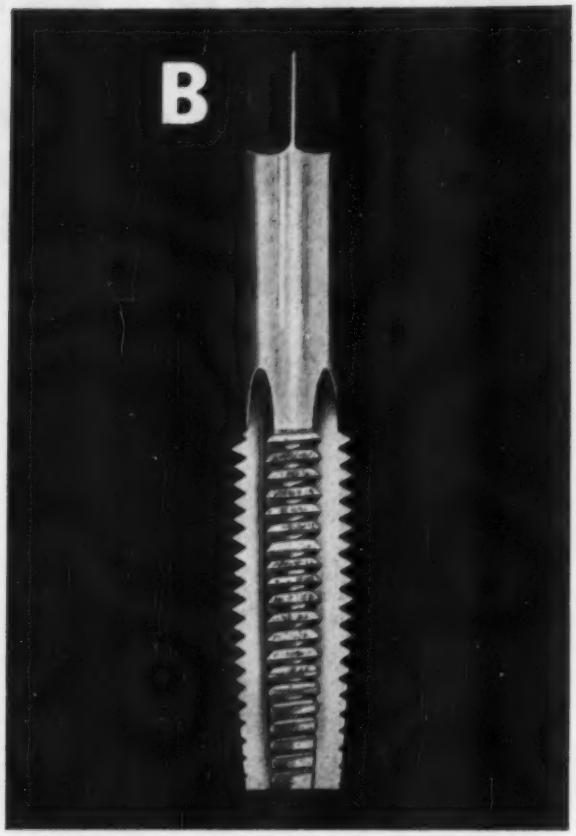
Frauenthal Division
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN, U. S. A.

F-256



WHICH OF THESE TAPS COULD NEVER GET PAST HY-PRO'S ELECTRONIC ANALYZER?





The serious defect in Tap B is invisible. But Hy-Pro's Electronic Analyzer detects all structural flaws for your protection.

HY-PRO'S amazing new Electronic Analyzer is one of the three important steps which Hy-Pro takes to insure you of *3-way Quality Control*. These three steps are the Electronic Analyzer, advanced Heat Treating and the Micro-Hardness Tester.

Here's how the Electronic Analyzer works. A standard tap, perfect in every detail, is put in one side of the machine. The tap to be tested is put in the other side. Electronic impulses are shot through both taps and every inch of each tap is tested as to composition, surface condition and internal structure.

The Hy-Pro Electronic Analyzer reveals every defect, including those that laboratory, production tapping and destructive tests fail to uncover!

The best part of the Hy-Pro story is that you get the benefit of these new Hy-Pro developments at no extra cost to you. Get in touch with your nearest Hy-Pro distributor or call us direct. Hy-Pro *quality-controlled* taps—products of the Tap Specialists—cost no more than ordinary taps.

REG. U.S. PAT. OFF.

HY-PRO

"The Tap Specialists"

New Bedford, Massachusetts, U. S. A.

ADDITIONAL WAREHOUSES:

10428 W. McNICHOLS RD.
DETROIT 21, MICH.
UNIVERSITY 4-1077

1132 LAWLER ST. (WORTH)
CHICAGO, ILL.
GARDEN 4-0217

105 EDISON PL.
NEWARK 5, N. J.
MARKET 2-4318

GUARANTEED ACCURACY
—as attained with any of the 7 SIP JIG BORERS and SIP OPTICAL JIG BORING, MILLING and MEASURING MACHINES—will furnish your plant with the permanent means (1) to define, establish and maintain the highest possible precision standards in your manufacturing processes, so as (2) to improve your quality-of-output and economy-of-operation. These and other profit-advantages are interestingly demonstrated in the film offered below.

FREE Showing 16mm. Sound Film
"PRODUCTION WITH PRECISION"

AMERICAN SIP CORPORATION
100 East 42 Street, New York 17, N. Y.

Please arrange, with no obligation, for a free group showing at my plant of your 25 minute, 16mm. sound film, "Production with Precision."

NAME
FIRM
ADDRESS
CITY
STATE

grinding wheels and need for supporting structures and extra bearing shafts on both sides of wheel.

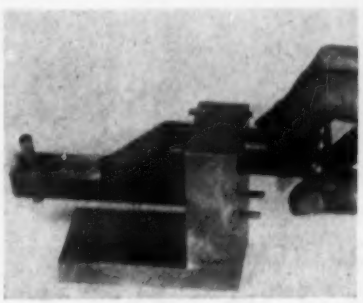
Commonwealth Engineering Co, Dayton, Ohio

Riveter head of noiseless, spinning type is designed for special production-line automation set-ups. Adapted from company's line of High Speed floor and bench rivet spinners, unit is air-actuated, with spinner itself motor-driven. Rivet capacity is to 5/16 in., spindle travel is ¾ in., and device is adjustable downward.

High Speed Hammer Co, 500 Norton St, Rochester 21, NY

Richmond Quick-Stop, designed to replace slow-acting depth stops on drillpresses, enables operator to reset stop in a one-hand operation requiring less than 12 sec. Positive-locking device requires less than 30 sec to install. Nut on stop slides up and down for speed, locks in place for accuracy. Eleven models for various drillpresses are offered, at prices ranging from $3.50 to $5.95.

Richmond Machine Products Corp, 276 Rose Ave, Staten Island 6, NY

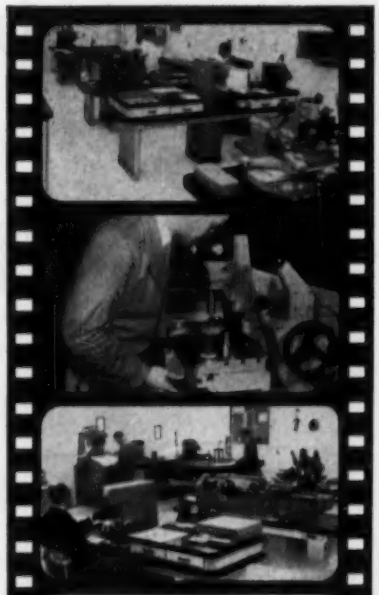


Small Size Radius Dresser Is Accurate to 0.0002 in.

Somerset Model JR, designed for bench surface grinders, shapes and dresses grinding wheel radii, either concave or convex, or combinations of both.

Any thickness wheel can be dressed up to and including ⅛-in. thick. Guards need not be removed, as wheel is dressed from below. Stop pins permit complete adjustment from 90° through 180°. Diamond dressing point is set by measuring with micrometer from top of measuring hood to bottom of dresser arm.

Somerset Tool Co, Virginia St, Hillside, N J



GUARANTEED ACCURACY
has developed from more than 90 years' specialization with practical metrology. The resulting SIP techniques—as used in length measurements by national Bureaus of Standards—may be most profitably applied with SIP UNIVERSAL & LINEAR MEASURING MACHINES, SIP high precision MICRO-INDICATORS, and SIP PROFILE PROJECTORS. How well these techniques and machines can work to your advantage is illustrated in the film offered below.

FREE Showing 16mm. Sound Film
"ABSOLUTE MEASUREMENTS"

AMERICAN SIP CORPORATION
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Please arrange, with no obligation, for a free group showing at my plant of your 25 minute, 16mm. sound film, "Absolute Measurements."

NAME
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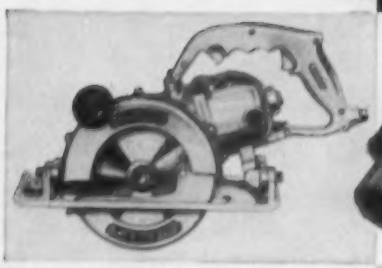
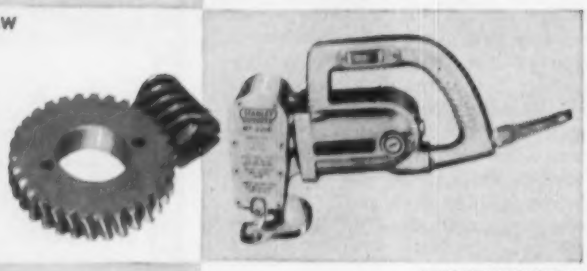
Perkins Precision Gears

Custom-Cut

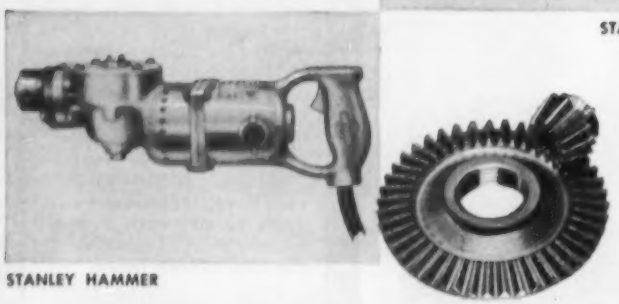
for **STANLEY**



STANLEY SAFETY SAW



STANLEY UNISHEAR



STANLEY HAMMER

FOR YOUR GEAR REQUIREMENTS

Check with Perkins!

STANLEY ELECTRIC TOOLS is a typical PERKINS customer. These Stanley power tools are famous for their quality and durability. For the vital drive elements Stanley comes to PERKINS. We specialize in cutting precision gears to customers' specifications . . . gears of all types, gears of all sizes.

Here is a partial list of what Perkins makes: bevel gears, ratchets, sprockets, ground thread worms, spiral gears, helical gears, spur gears with shaved or ground teeth, in all materials, metallic and non-metallic.

PERKINS MACHINE & GEAR CO.

101 CIRCUIT AVENUE, WEST SPRINGFIELD, MASS.

ROUND TABLE Discussion

WARNING: SICK LEAVE A'COMING

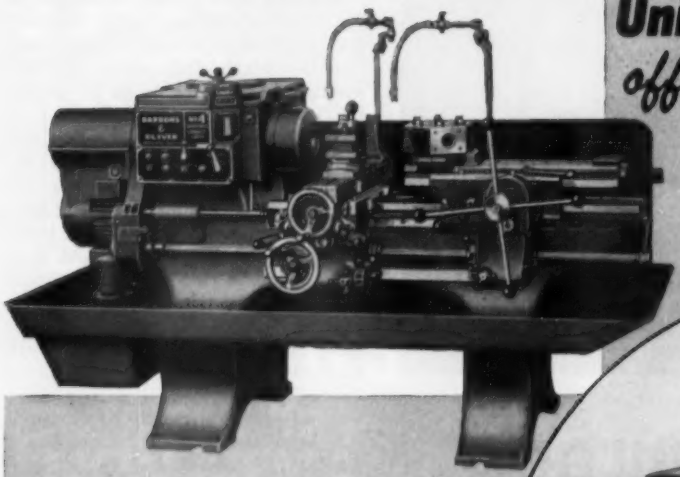
Could a plan be worked out whereby the men in the shop would tell their foreman in advance that they intend to take sick-leave days off for purposes other than illness? Would the knowledge help the foreman?

THE idea of Al thinking that any of his men would be confiding enough to confess to him—the foreman—that they were, on a given date, to "take advantage" of the sick leave with pay provision is really too bad to be true. If Al is dope enough to harbor such an illusion I have yet to meet the man on the shop floor simple enough to share it. No, Al, it simply won't wash; the scheme wouldn't work. Any man graceless enough to agree to Al's unholy compact, Al's conspiracy to defraud the company, could not be trusted to keep the matter to himself. Sooner or later the murder would out.

Al proposes to practice an evil so that good may result. If he knows anything about the moral code, he must surely be aware that such conduct is utterly reprehensible. Besides, he is handing it on a platter to the smart guys, the legpullers, worse still, to the vindictive who delight in creating chaos everywhere. What a golden opportunity for the fellow travelers to wreck Al's forward planning. Forward planning based on such a pathetic premise could not hope to succeed. Al's confederates in duplicity would be certain to double cross him by walking in on him at the agreed time for taking pseudo sick leave and thus mess up

"Hobson, you must have a hole in your head to hand in a report like this."

The BARDONS & OLIVER No. 4 Universal Turret Lathe offers these outstanding HEADSTOCK Features



- Sixteen geared spindle speeds, providing a fifty to one speed range
- Optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant horsepower (optional to fifteen) at all spindle speeds
- Fast operating and effortless electric headstock clutches
- Fully automatic spindle speed changing in less than two seconds
- Minimum number of gears in mesh at higher spindle speeds
- All anti-friction bearings
- Flanged type motor mounting
- All headstock gears of alloy steel, flame hardened and precision finished
- Headstock shafts of alloy steel, heat treated, ground-in-spline, of large diameter and short span between bearings
- All rotating assemblies statically and dynamically balanced
- Cool, filtered lubricating oil pumped to all headstock bearings, gears and clutches from separate reservoir in the head-end leg

The complete line of Bardons & Oliver Turret Lathes offers many outstanding features. Write us on your company letterhead for specific model information or send your blue prints for a proposal.

MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING-OFF LATHES

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

Cut DIE COST WHERE IT COUNTS MOST...

...BEFORE the die gets in the toolroom

Nothing makes a diemaker meaner than a sticky punch holder. Count the number of times he removes that holder building up a die and it's foolish to save a few dollars buying second-rate die sets.

That can't happen with Detroit Die Sets because . . .

. . . **from start to finish, under one roof, Detroit Die Sets are continuously inspected for accuracy, whether it's turning a shank or superfinishing a guide pin. Misalignment doesn't have a chance.**

. . **we are constantly working to improve our die sets. Recently developed ball bushings are an example. Extensive testing, in our own and customers' plants, has proven their value on certain applications. Now, they're available on Detroit Die Sets to extend production runs as well as making the diemaker's job an easier one.**

Details on the use of ball bushings plus other helpful information on cost-cutting Detroit Die Sets are available upon request. Write today, or see your local representative—he's as near as your phone.

Offices in Principal Industrial Centers

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

his schedule, knowing full well that Al could not retaliate with disciplinary action.

Morality apart, the weakness in Al's brain wave lies in the fact that his fellow conspirators would have him in their pocket, not a dignified position for a foreman to be in. On the other hand, the possibility of legpulling cannot wholly be ruled out here. Al may have sprung that one on Ed with his tongue in his cheek. I'd hate to think of douce, logical, down-to-earth Ed being bamboozled by the irrepressible Al. Sick leave is front page news in Britain today, vide the press. "Thirty miners in the highest paid pit in Britain have been paid for a night's work they never did and they got a bonus too." The thirty men *should* have worked on the night of June 14th.

They were traveling to work in a special bus which was in collision with a motor *cycle* but none of the miners was hurt. They drove to the pit and said "We are unfit to work tonight," then got into the bus and returned home. The National Coal Board ruled that the men should each be paid full pay as sick money for that night's absenteeism, on top of their week's earnings which qualify for a merit (!) bonus. The colliery manager stated "It's the highest paid pit in the country, but one of the worst for absenteeism." Perhaps it ill-becomes a Briton to criticize Al's morality after that revealing example of Nationalization—at a price. "Peace hath her victories no less renowned than war!"

Al should forget it. When Ed said to him "You're too naive, Al. You'd better resign yourself to guessing and let it go at that" he said too much. He should have stopped at

(Continued on page 212)

"Any one remember where I put my grapefruit?"

FIRST with a COMPLETE LINE OF SAFETY SWITCHES to meet the NEW NEMA STANDARDS

TYPE HD TYPE ND TYPE LD

• The table below shows Square D switches meeting new industry specifications. Notice how they clarify conflicting features which existed under old designations. Notice, too, that they establish a new, heavy-duty industrial switch, Type HD.

One important thing which remains unchanged is the **DESIGN LEADERSHIP** which has made **SQUARE D SAFETY SWITCHES** industry's overwhelming **FIRST** choice for more than fifty years. Compare them, feature for feature. They cost no more, why settle for less?

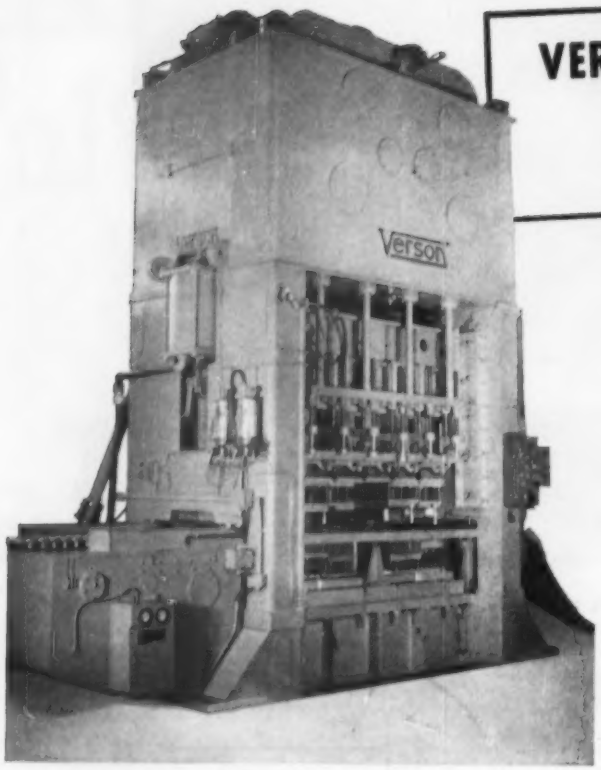
DESCRIPTION	HEAVY DUTY New	NORMAL DUTY formerly Types H, S, or A	LIGHT DUTY formerly Types D or G
Rating-Ampere Voltage	30—800 250 or 600V AC, DC	30—1200 250 or 600V AC, DC	30—200 250V AC
Enclosure	NEMA 12 • Industrial Use (Gasketed) NEMA 4 & 5 • Water-tight & Dust-tight NEMA 7 • Explosion-resisting Class I—Group D NEMA 9 • Explosion-resisting	NEMA 1 • General Purpose NEMA 3R • Raintight	NEMA 1 • General Purpose NEMA 3R • Raintight
Horsepower Rating	NEC Fuse Ratings Dual-Element Fuse Ratings	NEC Fuse Rating Dual-Element Fuse Ratings	NEC Fuse Rating
Operating Mechanism	Quick-Make, Quick-Break Independent of Handle	Quick-Make, Quick-Break Independent of Handle	Positive Make, Positive Break Spring Assisted
Cover	Interlocked & Padlock Attachment	Interlocked & Padlock Attachment	Padlock Attachment
Plating—Current Parts	Extra-Heavy Silver	Silver	
Endurance	Maximum Endurance Far Exceeds UL Standards	Exceeds UL Standards	Meets UL Standards

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

There is only one primary reason
for buying a Transmat press . . .

LOWER UNIT COSTS WHERE PRODUCTION



TYPICAL 500 TON VERSON TRANSMAT—This is the press that produces the valve covers described at the right. Today's Verson Transmat is the culmination of twenty years of specific development of an automatic process to produce multiple operation stampings. Since the installation of the first Transmat eighteen years ago,* the machine has progressed to the point where there is no limit to tonnage capacity or size of piecepart that can be produced. Transmats as small as 100 tons and as large as 4000 tons have been built.

*Still in service, producing 1300 oil filter shells per hour.

VERSON TRANSMAT PRESSES
are engineered and built
to give you this economy

If you produce any part requiring four or more operations on 4000 or more pieces per day, Verson Transmat Presses offer remarkable opportunities for cost reduction.

The Verson Transmat is designed and built solely for the purpose of producing multi-operation stampings at the lowest possible cost. Design is not compromised in any way that will affect this objective! As a result Verson Transmats offer a combination of advantages available in no other transfer press—

- High speed—20, 25 and even 36 strokes per minute with machines having capacities up to 4000 tons.
- Positive, direct, gear driven transfer mechanism with safety interlocks make misfeeding impossible.
- Non-oscillating feed bars, only the fingers move in and out—fast, smooth action.
- Automatic, delayed action, adjustable stroke knockout cylinders at each station—prevents damage to piecepart by positive stripping and location.
- Individual adjustable wedge slides for precise die adjustment.
- Fully automatic lubrication—two Cascade oil flow systems and two pressure systems.

When you buy a transfer press be sure you get the high production you are paying for. Be sure you get the efficient, trouble-free operation that Verson know-how assures you. Described at the right are a few of the jobs being performed successfully at this moment. We'll be happy to tell you about others . . . and we'll welcome the opportunity to show you what Transmats can do for you. Write or phone.

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

Verson

VERSON ALLSTEEL

9316 S. Kenwood Avenue, Chicago 19, Illinois

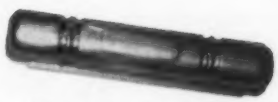
MECHANICAL AND HYDRAULIC PRESSES • TOOLING • TRANSMAT

ON JOBS REQUIREMENTS ARE HIGH

Here's Proof

of what VERSON TRANSMATS can do

These are verified production figures of a few of the Transmats in use in metalworking plants at this moment.



20⅜" x 3⅜" x 2¾"—18 ga. stock.

1,200 VALVE COVERS PER HOUR

Five operations on each, a total of 6,000 press operations per hour. The part is formed from strip. Two such presses are currently in operation, both since 1954.

5" diam. x 2¼"—16 ga. stock.

1,500 MOTOR HOUSINGS PER HOUR

Ten operations on each, a total of 15,000 press operations per hour. The part is formed from strip. One 600 ton Transmat has been in operation for over one year.

7" diam. x 4"—20 ga. stock.

900 HEADLAMP HOUSINGS PER HOUR

Six operations on each, a total of 5,400 press operations per hour. The part is formed from pre-blanked stock. Five 250 ton Transmats of this type are in service, the earliest since 1949.

19½" x 3¾" x 5½"—.1606" stock.

1000 AXLE HOUSINGS PER HOUR

Seven operations on each, a total of 7,000 press operations per hour. The part is formed from previously developed blanks. Two such 2,200 ton Transmats have been in service for about one year.

PRESS COMPANY

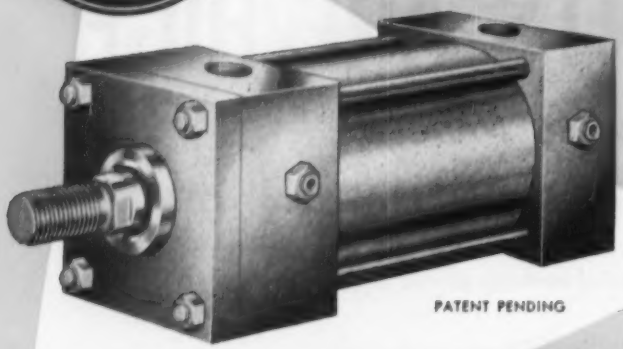
8300 S. Central Expressway, Dallas, Texas

Verson

PRESSES • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

FOR AUTOMATION

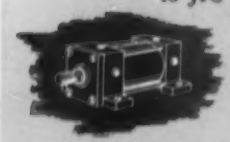
SP CYLINDERS



PATENT PENDING

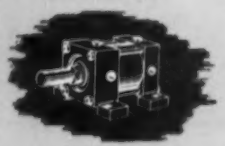
top performance–longest life

All S-P cylinders are engineered throughout for high speed, efficient operation. Piston rods are heat treated and hard chrome plated to resist scoring. Bronze cartridges with extra long bearing surfaces are easily removable for quick servicing of rod seals and wipers. End plates are rolled steel. All S-P cylinders are built to JIC standards.



S-P STANDARD AIR CYLINDERS have brass tubes to eliminate corrosion. Cushions float on O-rings for maximum cushioning. Eleven bore sizes, 1½" — 14". 21 mounting types. Readily modified for oil or water. Send for Catalog No. 110.

S-P HEAVY DUTY AIR CYLINDERS for automation and other severe applications. Double porting for extreme high speeds. Heavy wall seamless steel tube. Nine bore sizes, 1½" — 8". Five mounting types. Approved and used by two major automobile manufacturers. Send for Catalog No. 109-A.



S-P HIGH PRESSURE HYDRAULIC CYLINDERS have seamless steel tube. Special locking mechanism eliminates tie rods. Designed for 2,000 psi. Eleven models in 11 sizes. Send for Catalog No. 104.

Step up production with S-P cylinders. Representatives in principal cities. Prompt deliveries. Order catalog by number shown above. The S-P Manufacturing Corporation, 30201 Aurora Rd., Solon, Ohio. *In greater Cleveland.*

SPecify SP

SP THE S-P MANUFACTURING CORP.

SOLON, OHIO • *IN GREATER CLEVELAND*

ESTABLISHED 1916 A BASSETT COMPANY

NON ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS
POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • AIR FITTINGS, VALVES, ACCESSORIES

"resign"—and let it go at that. If the company is not aware that the men, or some of them, are fiddling the slick leave—"slick" is a typing error here, but on the whole it seems appropriate—it is Al's duty to report the matter to Harrison. If the company already knows, and for reasons of its own is prepared to wink at the irregularity, that is no concern of Al's and does not confer on him the right to encourage fraudulent practices. There's a deal of difference between winking at an irregularity and actively encouraging it.

I assume the terms "ball games and fishing" to be symbolic of summer attractions or distractions, depending on whether one is an irresponsible operator or a responsible executive. Experience has taught me that any really alert foreman soon becomes familiar with his men's characteristics and shades them off into different tones. He will soon know those who are ever ready for a few days off and, later, what they do with those days off. Having that information at his finger ends, it is a short step to filling in such details as dates and duration of absence. At best, dates will be approximate unless, perhaps, in the case of race meetings, cup finals, etc, usually well advertised in advance.

Thus it all bounces back on the shop foreman who should and usually does know each man as he knows the back of his own hand. I called on a works manager friend in a small shop employing some sixty men, some weeks ago; not a sound of activity was to be heard. He ex-

"Oh yes, Mr. Schmidt was expecting you. He's not in."

VANADIUM ALLOYS STEEL COMPANY

DIE STEELS

for cold work

Colonial No. 6

The most versatile of all cold work die steels. A manganese oil hardening type specially annealed for easy machining—the best steel for general tool room work. Available from stock in all warehouses.

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A deep hardening steel having exceptional strength and toughness. Hardens to Rockwell "C" 65 by cooling in still air with considerably less movement than manganese steels. A general-purpose die steel with exceptional resistance to wear. Also available in FM (free machining) type. Stocked in all warehouses.

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Air (or oil) hardening, high carbon-high chromium steel providing least movement in hardening, maximum wear life, and strength and toughness sufficient for virtually every cold work die steel application. Wear resistance five to eight times that of low alloy steels. Available in FM (free machining) type also. Stocked in all warehouses.

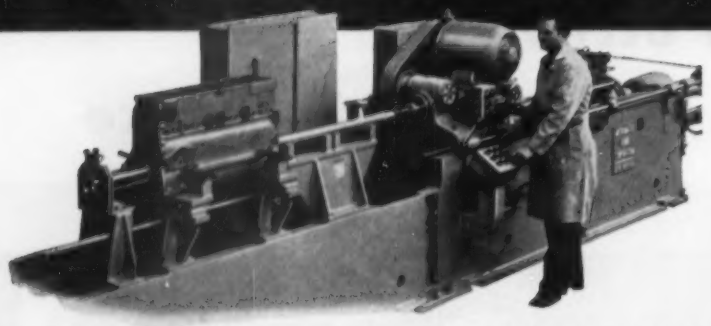
FIRST QUALITY Die Steels, known and used by discriminating diemakers throughout America wherever better behavior in fabrication and longer life in service lead the list of specifications. Each of these famous steels offers special advantages in service, joining with the other grades in our Cold Work die steels family to blanket every application requirement. Available in precision-ground flats and squares. Let us send you detailed Data Sheets for your files.

Vanadium-Alloys Steel Company

Latrobe, Pennsylvania

SUBSIDIARIES: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited
Vanadium-Alloys Steel Societa Italiana Per Azioni

WHY CUMMINS main bearings are MICROHONED

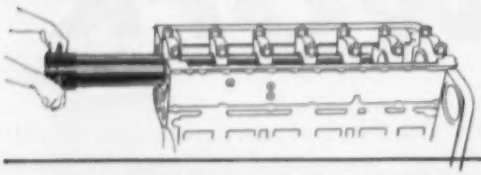


"Cummins diesel engines have a world-wide reputation for dependable, low-cost power. Here at Cummins, we attribute the wide acceptance of our engines to constant searching for better processing methods and improved engine performance.

"For example, if our crankshaft main bearings were undercut at the ends, tapered or out-of-round, then the full load of the journals would be borne by relatively small areas. This would cause bearing inserts to overheat and quickly break down. Also, should the bearings be misaligned, the crankshaft would flex during rotation and cause fatigue failure.

"However, by Microhoning our main bearings we secure *round, accurately-sized* and *aligned bores.* Cummins is the first diesel manufacturer to Microhone its main bearings. The surfaces of Microhoned bearings are clean-cut, free of deformed metal and the finish is consistent in every bore. In addition, the consistent accuracy generated by Microhoning permits us to make faster set-ups and use higher cutting feeds on preceding boring operations—Microhoning automatically corrects all inaccuracies.

"After Microhoning, all main bearing bores are checked with a gage plug 44 inches long and .0007 inch under required bore size. Gage must have a simultaneous slip-fit through all bores in the block. Tolerance for roundness is less than .0002 inch and finish is held to the specified 55 microinches."



Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

plained "They're all off to the races." That seemed to happen three times each year. No permission was ever asked, none was ever given. The matter was decided by a ritual known as "throwing up the brick." The modus operandi was as follows. The men assemble at the factory gate at 7:30 AM and an appointed one calls "Will we work?" Chorus, "Throw up the brick." A brick is then tossed into the air and, if it comes down, the men turn homewards to prepare for a day's racing. Had the brick remained in the air, they'd have worked!

C D Mackinnon
Lanarkshire, Scotland

Al's plan to have the men give advance notice before they take sick-leave days is impractical for many reasons. Al is part of the management team and will find it extremely difficult to sell this idea to the men. He will be unable to instill sufficient confidence and trust in his subordinates to have them give him information of this nature.

Let's take a practical viewpoint on this problem. Al is attempting to have the men give him confidential information which can possibly be used against them. The men can be told just why he wants this information and they may trust him and believe him. However they will still resist cooperating with him because they can see the possibility of a time in the future when because of new circumstances and conditions their relationship is no longer on such a

"You come in handy—like an eraser on a pencil."

warehouses.

friendly basis. At such a time this information may be used against them.

In addition, this plan will create distrust, for the men are sure to feel that even though they all agreed to it, there will be many who will not follow it. They will continue to take such leave days without prior notice, just as before the conception of the plan. They will do this in the hope that Al will believe they are really sick. If he does, it may enhance their position and increase the possibility of a raise or a promotion. For them the plan will serve as an additional proof of their illness.

Such a plan will put Al in a precarious position. He cannot hope to keep such an arrangement secret from Harrison when so many people are in on it. He is sure to cross somebody and they will drop a hint to Harrison just for revenge.

If Al is wise he will take Ed's advice and not even mention such a plan to the men.

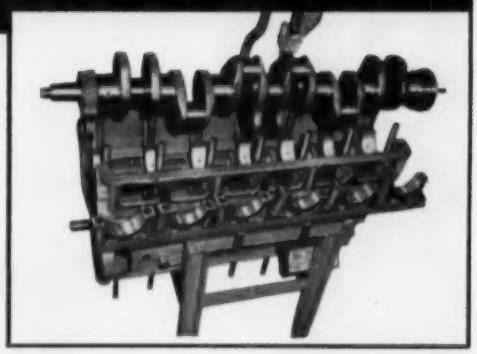
Ernest Jones
Bronx, NY

I THINK Al should forget about his foolish idea of leading his men astray. That is what his sick-leave idea amounts to. If some of the men don't know how to appreciate the company's interest in their health, they evidently know how to feather their own nests. Al is on the verge of making a laughing stock of himself and should try to improve the position by a little constructive thinking.

By ganging up with the least dependable of the men he runs the risk of spreading the infection among those who, better led, would claim sick leave only when they felt unfit for work, instead of claiming and using it for a jamboree. If Al were to concentrate on leading, instead of following, he would be held in high esteem among his men and would be doing what the company hires and pays him for. Instead of working to disrupt the shop discipline, Al should turn his attention to improving it. He cannot hope to improve it by conniving at cheating on the part of some of his men. Al must bear in mind that honesty is still the best policy and dishonest planning will hit back at him in the end. He need not look for lasting success in that direction.

Commonsense Ed puts his finger on the weak spot when he fears Harri-

HOW MICROHONING generates round, accurate, aligned bearing bores



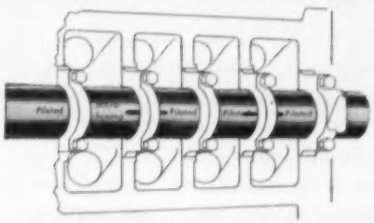
All types of cylindrical surfaces, including small diameters and combinations of soft and hard metals . . . interrupted by keyways, undercuts, ports, reliefs or cross holes . . . can be economically Microhoned to precision tolerances and alignment.

A typical example of Microhoning interrupted cylindrical surfaces is the Cummins Diesel Engine application. Here's how Microhoning generates accuracy and alignment in the crankshaft main bearing bores:

1. Cutting pressure is applied radially from the center of the Microhoning tool body. Abrasives and guides both are expanded by the same feed force, and wear at the same rate.

2. Abrading action is divorced from the effects of spindle or driveshaft vibration and misalignment by a universal joint that is between tool body and driveshaft.

3. The single bank of abrasives travels through all bores on every stroke. As abrasives are Microhoning one bore, the tool is piloted by the plastic guides in the other bores.



The principles and applications of Microhoning are thoroughly explained in a 16mm, 30-minute sound movie, "Progress in Precision". We'll be glad to reserve a print for your use.

☐ Please send me "Progress in Precision" in time for showing on _____ (date).

☐ Please send Microhoning literature; I am interested in the following application _____

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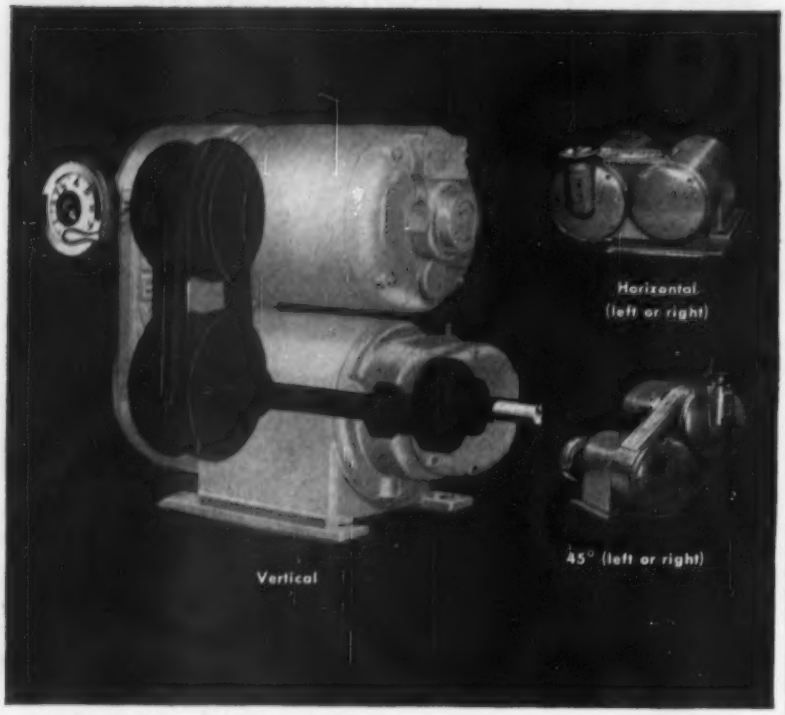
A Compact Model to Fit Wherever You Need Variable Speed



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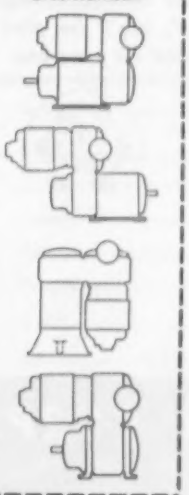

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REEVES PULLEY COMPANY
Division of **RELIANCE** ELECTRIC AND ENGINEERING CO.
Columbus, Indiana

son would smell a rat if Al could schedule, months ahead, cover for the men who would then be on sick leave. This is a case of Al throwing discretion to the winds and when that happens, planning becomes gambling. Harrison would indeed be dumb if he did not wonder at Al's uncanny foresight in guessing, to a man, who would be on sick leave and at what time throughout the year. He might think that all gamblers have a good year at some time but, if Al's little plan succeeded over a few years, the fat would be in the fire and Harrison would perhaps ask a few awkward questions. At best, it would be a shoddy business, a negative success which could bring Al down in the end.

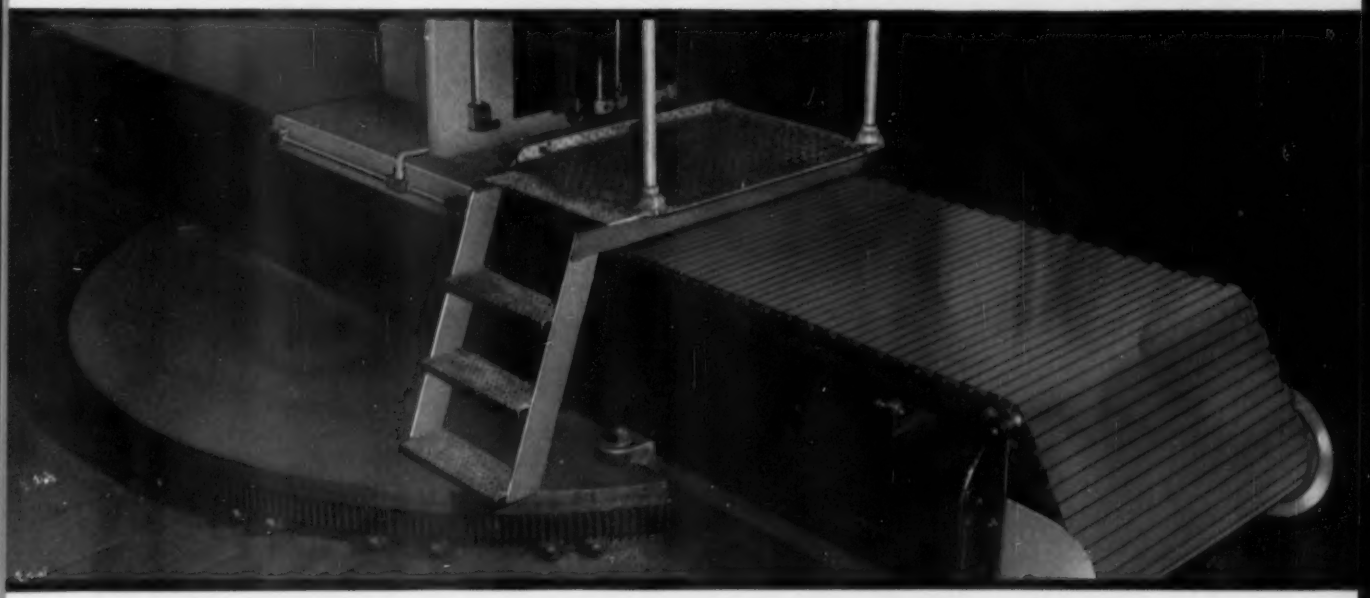
It could be that sick leave is intended by the company as an extra insurance for the men and the company to prevent a health breakdown, due to overstrain, if high speed production and long hours were common in the plant. Some companies make provision for this through their welfare organization, and most forward-looking people regard the arrangement as the height of wisdom. It is on all fours with the practice of preventive medicine.

Unlike the procedure at Al's plant, there is nothing casual about the arrangements made for resting the men in need. The arrangements are carried out by the company's medical man. Frequent checks tell him when any employee is showing the red light and he makes the necessary plans for a tonic lay-off. In that case, the man does not tell the foreman when he is taking sick leave; the doctor tells *him*. That system does away with the guessing that Ed advocates.

It has a further merit, the company

"If his production in the shop was half as good as his production is at home . . . we'd all be rolling in money!"

Futurmill "Way-Life" Covers– Made Better for Less with Reynolds Aluminum Extrusions



Engineers at Futurmill, Inc. of Pontiac, Mich. and Reynolds Designers put their heads together to take advantage of the amazing flexibility of aluminum extrusions . . . to make "Way-Life" Covers provide better protection for machine ways . . . at lower cost.

The result of this cooperative effort: 1½" wide interlocking extruded slats of 6063-T5 aluminum—flexible enough to provide custom made covers of any length or width—covers that roll up compactly at either end of a machine. They are strong yet lightweight . . . strong enough for machine operators to walk on safely for job set-up . . . light enough to make covers easy to install. They will not stretch or tear . . . hot chips will not burn them.

Fabrication of the covers simply requires cutting the slats to length, riveting a small section of another aluminum extrusion to the ends of every other slat—to prevent sideway movement—and assembling the interlocking slats. Reynolds engineers designed the aluminum end extrusion to replace a casting—at a savings of $0.05 per piece.

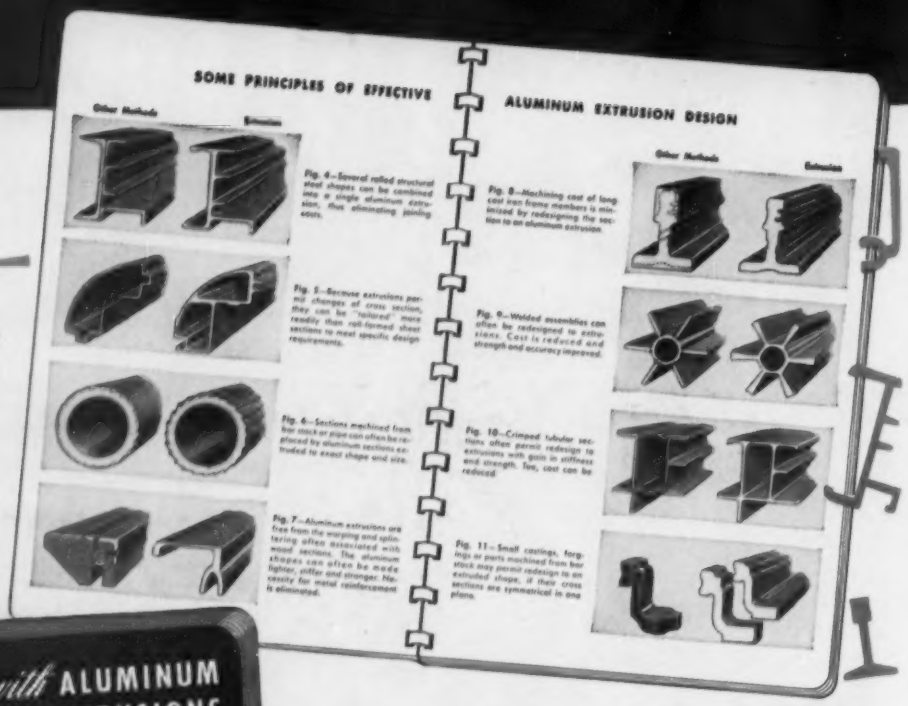
Consider improving your product with aluminum extrusions—from Reynolds. Remember, aluminum extrusions offer infinite *flexibility* of design . . . and Reynolds engineers offer invaluable *experience* in design.

For more information about aluminum extrusions and Reynolds Design and Engineering service, consult the nearest Reynolds Office listed under "Aluminum" in classified telephone directories. Or write *Reynolds Metals Company, P.O. Box 1800-JJ, Louisville 1, Ky.*

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

See Reynolds New Program, "Circus Boy", Sundays on NBC-TV

How to Take Advantage of Aluminum Extrusions


SOME PRINCIPLES OF EFFECTIVE ALUMINUM EXTRUSION DESIGN
Other Methods
Extrusion
Fig. 4—Several rolled structural steel shapes can be combined into a single aluminum extrusion, thus eliminating joining costs.
Fig. 5—Because extrusions permit changes of cross section, they can be "tailored" more readily than roll-formed sheet sections to meet specific design requirements.
Fig. 6—Sections machined from bar stock or pipe can often be replaced by aluminum sections extruded to exact shape and size.
Fig. 7—Aluminum extrusions are free from the warping and splintering often associated with wood sections. The aluminum shapes can often be made lighter, stiffer and stronger. No necessity for metal reinforcement is eliminated.
Fig. 9—Machining cost of long cast iron frame members is minimized by redesigning the section to an aluminum extrusion.
Fig. 9—Welded assemblies can often be redesigned to extrusions. Cost is reduced and strength and accuracy improved.
Fig. 10—Crimped tubular sections often permit redesign to extrusions with gain in stiffness and strength. Too, cost can be reduced.
Fig. 11—Small castings, forgings or parts machined from bar stock may permit redesign to an extruded shape, if their cross sections are symmetrical in one plane.

138 Page Reynolds Handbook Shows How to Increase Design Efficiency ...Lower Production Costs

Limitations of rolled structural shapes, formed sheet sections and machined, cast or welded parts are soon forgotten when you thumb through the authoritative handbook, "Designing With Aluminum Extrusions." The many important advantages obtainable with extrusions are shown in the above pages reproduced from the book.

Extrusion dies are inexpensive, so special shapes that use the metal most efficiently can be produced economically. The handbook shows how . . . with 126 illustrations and chapters on Features of Aluminum Extrusions; Examples of Effective Extrusion Design; Manufacturing Possibilities; Shape Design from Manufacturing Standpoint; Structural Design Considerations; Finishes; Cost Factors and a wealth of other essential data.

Your free copy of "Designing With Aluminum Extrusions" is available, along with a complete index of other helpful Reynolds literature, when requested on a business letterhead. Simply write to *Reynolds Metals Company, P. O. Box 1800-JJ, Louisville 1, Kentucky.*

See Reynolds New Program, "Circus Boy", Sundays on NBC-TV

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

doctor, if routine examinations are regularly carried out, can give the foreman a hint of possible casualties and he can be turning over in his mind what will be required by way of cover. Rather like modern weather forecasts if more reliable. If the doctor's fears prove to be groundless, so much the better for all concerned. The foreman is put to no great inconvenience, either way.

It is all to the good for master and man that employers should take a deep and practical interest in the health of their employees but the interest should be properly safeguarded. It should not be allowed to degenerate into a racket. If, between examination, a man feels in need of a rest he should report to the company doctor who may disagree. The man's own medical can then be called in and a decision arrived at between the two doctors. All the men know they can have time off if they feel so inclined but if the doctor doesn't OK it, they forfeit their pay while off work.

The system just outlined cuts right across bogus or frivolous claims. It would cure Al's headache and give him no excuse for lowering himself in the eyes of those he is paid to lead and guide.

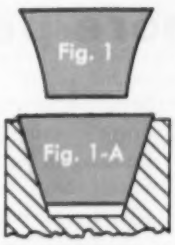
J C Ball
Stranraer, Scotland

SICK leave is granted to employees when too ill to work, and those fellows who abuse it are not being fair to their employers.

I do not agree with the idea of encouraging employees to use this time for anything else. If the foreman encouraged the workers to give notice when they are going to be absent, the employees would take advantage. They would go to the ball game and other affairs and use up this sick leave. When they were really sick they would have additional time off. It is the foreman's duty to live up to the rules. Practice should be in line with policy or we have no policy.

I do agree that the workers would feel cheated if they did not eventually get this time off. I would rather encourage the employees to build up this time off. They could add these extra days on to vacation or even carry them over from year to year. This would benefit both the company and the employees, and the foremen could better arrange their

Why you get more service from V-Belts with CONCAVE SIDES



Each sidewall of a Gates V-belt is concave (Fig. 1)—a precisely engineered curve that makes V-belts last far longer.

HERE'S WHY: on the bend around the sheave, the concave sides of a Gates V-belt fill out and become straight (Fig. 1-A). Thus the belt makes full contact with the sides of the sheave, grips the sheave *evenly*. This even contact distributes wear uniformly across the sides of the belt.

Uniform wear lengthens belt life; keeps costs down.

MAKE THIS SIMPLE TEST

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the pulley groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

To cut down-time and V-belt replacement costs, specify belts that grip evenly and wear longer. Specify Gates Vulco Rope—the V-belt with concave sides. There is a Gates distributor nearby who will quickly supply the belts you need. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA 109

Gates

Gates VULCO ROPE Drives

Hot spray. *Film-thickness gauge measures single coat of paint sprayed hot. Gauge reads 2.1 mils.*

Cold spray. *One coat of the same paint sprayed in conventional manner measures only .8 mils.*

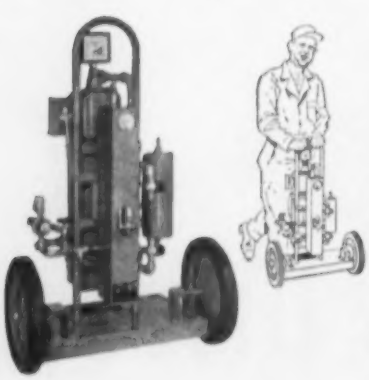
Film-thickness gauge reveals DeVilbiss hot spray puts on more paint per coat!

Each of the steel panels in the test above was sprayed with a *single coat* of black vinyl paint. But the results measured on the film-thickness gauge show one important difference – the paint on the hot-sprayed panel is nearly three times heavier than that on the one sprayed by ordinary methods.

By the controlled application of heat to the spray material, DeVilbiss hot spray gives you heavier film build . . . even with standard formulations.

What's more, materials can be applied efficiently at far lower spraying pressures, greatly reducing spray fog, and resulting in up to 50% savings in material. Finishes dry faster; shrink less; come out glossier. And because fewer passes are needed, operator fatigue is cut way down.

DeVilbiss hot spray is usable on all types of products; can be your means to better finishes at lower costs. For facts on just how much DeVilbiss hot spray can save *you*, call your nearest supplier now! Or write for Bulletin F-286.



Hot spray goes to the job *—anywhere—with this new DeVilbiss Portable Paint Heater! Self-contained on easily moved truck, it is complete with automatic controls. Heat-jacketed hose —available in lengths up to 50 feet—keeps paint hot right up to the gun. Write for Bulletin IE-1148.*

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Toledo 1, Ohio

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BRANCH OFFICES IN PRINCIPAL CITIES

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DEVILBISS

schedules. In this way they would give notice without breaking the rules.

A E Salmons
Norristown, Penna

Two wrongs don't make a right. If men abuse a hard-fought-for privilege such as sick leave, a foreman is only adding coal to the fire by tolerating their uncalled-for absenteeism.

Even if Al's plan were ethical, it would hardly be logical. A man who cares so little for his employer that he amuses himself on company time, would hardly bother to take the trouble to act in cooperation with his co-workers. In fact, if such notification were encouraged, a downhill trail would be set for people who never thought of staying out for reasons other than illness.

When a company doesn't enforce stringent regulations about the use of sick leave, scheduling problems could be solved to some degree by forecasting absences on the basis of the average attendance records over a period of several seasons. In doing this, variable factors such as temperature and dates of major sports events should be considered.

Joseph McLaughlin
Belle Harbor, NY

QUICK STUDY . . . OR TRY-AND-SUCCEED?

Is a foreman the best judge in sizing up and placing a job applicant in his own department? Or is Personnel better equipped to gage the abilities and experience of the worker?

As a business grows organization sets in, the problems of administration increase. As organization sets in we have the specialists who take over the duties that were originally part of the foreman's job. As production increases techniques are introduced for greater production, cost reduction, and quality. This requires more time and energy from the foreman. As an organization expands so does the need for staff function.

The staff is associated with the line, not apart from it. The head of one department sometimes finds fault with the specialist in another, but very often it is a misunderstanding of the relationship.

The addition of staff function does not lessen the importance of the foreman. As the organization grows so do the activities of the foreman and the need arises for active participation of Personnel and other specialists.

A good foreman is not necessarily the best judge of a new employee. I believe organized training is better than the old method for a busy, expanded industry. They are a necessary partnership.

A E Salmons
Norristown, Penna

HAVING worked in the employment office of Radiomarine Corporation of America, I would like to express my opinion on your Round Table topic.

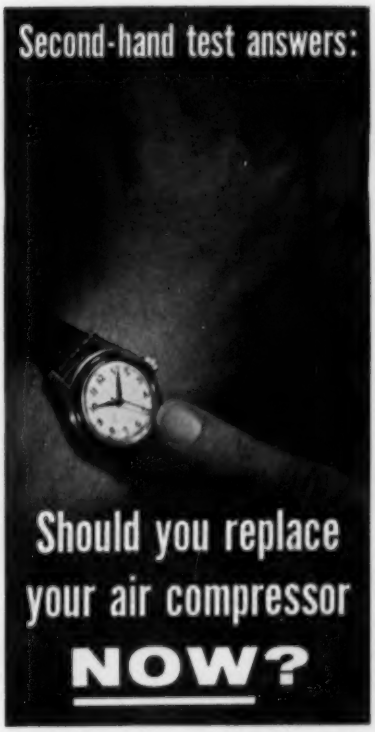
A personnel department in any good sized organization is an essential time saver. People in a personnel office are trained to interpret certain traits that an applicant might reveal during an interview. Revelation of these same traits might be meaningless to a foreman who is inexperienced at judging a man within a minimum time limit.

A responsible personnel manager can direct a capable receptionist to screen a certain percentage of the applicants who would waste the time of all concerned if they were to fill out an application.

A skilled interviewer has at his disposal a special questioning technique, the results of which are particularly meaningful to him in determining the value of a candidate.

After due process of elimination, many successful personnel departments present the best prospects to

"This one's for the shop, foreman's office, and that's for the boss."



An air compressor that runs well can fool you into thinking, "It works well, too!" Fact is, it may be running far more than it should, and inflating your compressed-air costs way out of proportion. That's because current consumption is the major expense item for compressed air.

A simple test with your own watch quickly and accurately tells if you'll be money ahead to install a new DeVilbiss compressor now. You may find that you are already paying for a new compressor through too-high operating costs!

DeVilbiss air compressors in horizontal or vertical models, ½ to 15 hp.

What To Do

Phone your DeVilbiss jobber today for the DeVilbiss Compressor Catalog CL-b, containing the simple test that you can make yourself, using your own watch.

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FOR BETTER SERVICE, BUY
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Shop Superintendent Bonnafe and Gulf Sales Engineer G. R. Burnham check on performance of Gulfcut 51A as turret lathe turns a stainless steel drive roll for a wire belt.

"Gulfcut gives us longer tool life,"

says Joseph Bonnafe, Shop Superintendent, J. W. Greer Company, Wilmington, Mass.

Shop superintendents like Mr. Bonnafe, engineers and machine tool operators ***know*** that production can be improved and costs lowered through the use of cutting oils designed specifically for the job. And, they know they can get the right oil for *every* job from the complete line of Gulfcut Oils. Reports like these come from the field every day:

From an aluminum plant: ". . . stepped up production of aluminum caps 25%, increased tool life well over 100%, and we're getting better threads."

From a plant working tough titanium-alloy stainless steels: ". . . results were phenomenal. Tool life increased over 40% and surface finish was improved 43 microns."

Your Gulf Sales Engineer can pin-point your cutting oil requirements—can help you improve shop efficiency through the use of the most suitable cutting oils for your needs. Contact him today at your nearest Gulf Office.

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1822 Gulf Building
Pittsburgh 30, Pennsylvania

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their prospective supervisors. The experience of many companies has shown that this coordination between the departments has made for smoother operating conditions.

C McLaughlin
Rockaway Beach, NY

In the modern plant each department functions as a team. The man may be assigned individual jobs but cooperation is still essential to success. There is always a need for advice and help. The foreman knows his department and his men and is in the best position to determine whether a new man is suitable for his team. It takes more than a knowledge of the machines and their operation to become part of the department. A new man may actually have too much experience for a particular department and be unhappy in his work because it does not test his skill.

The people in the personnel department may be well trained in the methods of conducting interviews and the interpretation of job requirements, but to accurately recognize the levels of skill one really needs first-hand experience.

There are factors other than skills that influence the success of a new man. One of these is nationality. There will be certain departments in a plant which will lean toward certain nationalities. It may be the policy of the company to be completely unbiased in its hiring but they cannot overlook the attitude of the other employees when placing a new man in a department. The foreman is close to the men and knows

WINNER! MILL & FACTORY'S "FEATURE PRODUCT AWARD" OCTOBER, 1956

SUPREME Push-Pull Tapper

New Power Drill Attachment Taps to Highest Standards . . . Cuts Breakage . . . Lowers Costs

Mill & Factory Magazine's Board of Review has designated Supreme's new Push-Pull Tapper as winner of their "Feature Product Award" for October. This Board is composed of a group of engineers, editors and production experts who each month study hundreds of new items that are being offered to industry for the first time. They select the one product they feel is the most needed by all industry.

The Supreme PUSH-PULL TAPPER is an instant-reversing speed reduction unit made expressly for tapping. It attaches easily to either the spindle or chuck of any portable drill. Detachment after use is equally simple. The speed reduction of 7:1 gives more than adequate power to tap in all materials, and the instant-reversing means that the direction of the tap can be reversed without stopping the drill motor. Thus the tap can be moved into and out of the hole at will.

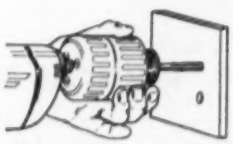
Reduces Tap Breakage

Tap breakage is held to minimum when the PUSH-PULL TAPPER is used, because the operator has a better "feel" for his work. When in use the TAPPER housing is held in the finger-tips, and any unusual strain is felt immediately. Releasing the fingers stops the tap instantly.

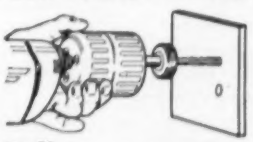
Handles Taps Up to 5/16" Dia.

The complete PUSH-PULL TAPPER Kit, No. 9000, costs just $29.95; includes everything except taps. Order from your Industrial Distributor.

HOW IT WORKS:



Push and the tap runs in smoothly . . .



Pull and it comes out easily . . .

That's all you do— **Push-Pull**

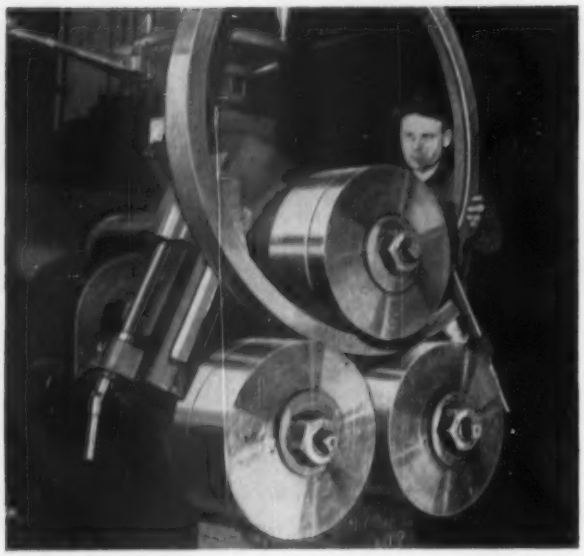
By the makers of famous SUPREME *brand* CHUCKS

On new equipment . . . for every replacement . . . demand Supreme Chucks . . . the line that's "UP FRONT" on leading power tools. Exclusive hardening process

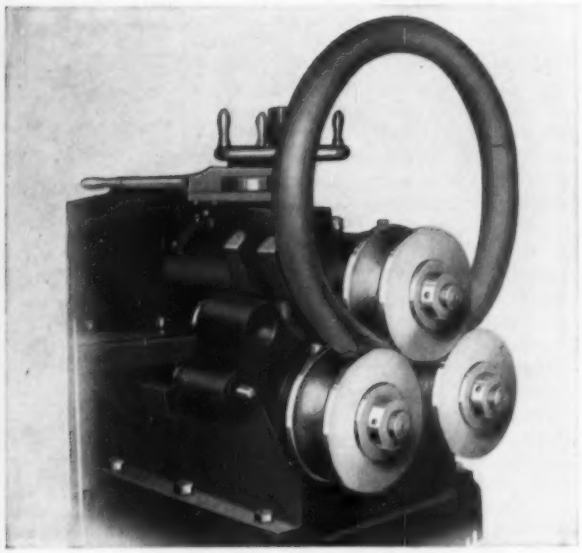
SUPREME PRODUCTS CORPORATION
2222 SOUTH CALUMET AVENUE, CHICAGO 16, ILLINOIS

BEND THESE PIECES COLD —

with "Buffalo" Bending Rolls



The difficult leg-in angle bending is easily and accurately done on "Buffalo" Bending Rolls.



Bending 5" copper tubing on "Buffalo" No. 2 Bending Roll. Last pass after straight ends are trimmed off.

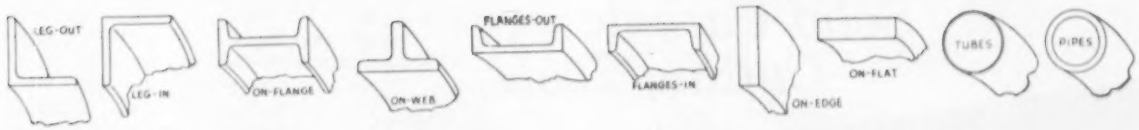
VERTICAL BENDING ROLLS

Capacities	½	1	2
Angles—leg out	2x2x¼	3x3x⅜	4x4x⅝
Minimum diameter	20	24	40
Angles—leg in	1½x1½x¼	2½x2½x⅜	3½x3½x⅝
Minimum diameter	18	30	48
Smallest Angle—leg out	¾x¾x⅛	1½x1½x⅜	1½x1½x¼
Minimum diameter	8	13	18
Smallest Angle—leg in	¾x¾x⅛	1½x1½x⅜	2x2x¼
Minimum diameter	9	14	24
Beams on flanges	3"-7½#	5"-12¼#	8"-18#
Minimum diameter	24	40	60
Channels—flanges out	3"-4#	5"-11½#	9"-20#
Channels—flanges in		5"-9#	7"-14¾#
Minimum diameter	16	18	48
Flats on edge	2x⅛	3x⅛	4x1
Minimum diameter	24	36	48
Flats on flat	3x⅜	6x1	9x1¼
Minimum diameter	20	24	30
Rounds and squares	1½-1⅝	2-1⅝	2⅝-2½
Minimum diameter	20	24	30
Copper tubes—12 gauge	1¼	3½	5
Copper tubes—16 gauge	2	4	6
Standard st. pipe	1½	2	3½
X heavy pipe	1¼	2	3
XX heavy pipe	1	1½	2½
Minimum diameter	16	20	24

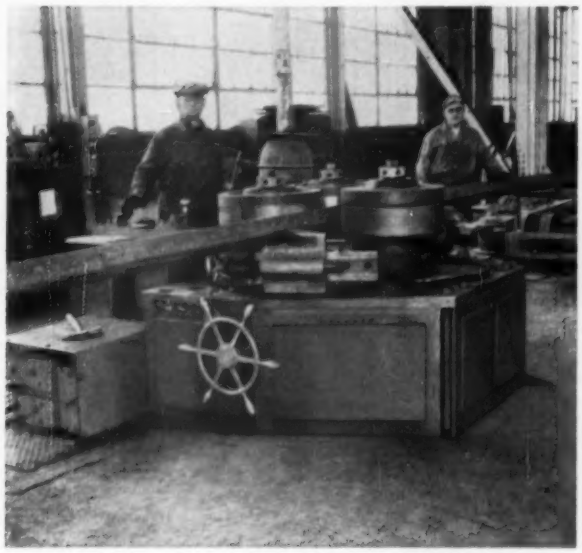
HORIZONTAL BENDING ROLLS

½	1	2	3	4
2x2x¼	3x3x⅜	4x4x⅝	6x6x⅞	8x8x1
20	24	40	60	84
1½x1½x¼	2½x2½x⅜	3½x3½x⅝	5x5x⅞	8x8x1
18	30	48	66	144
¾x¾x⅛	1½x1½x5/16	1½x1½x¼	2½x2½x⅜	3x3x½
8	13	18	30	36
¾x¾x⅛	1½x1½x5/16	2x2x¼	2x2x⅜	2½x2½x⅝
9	14	24	30	48
3"-7½#	5"-12¼#	8"-18#	12"-30#	15"-60#
24	40	60	72	96
3"-4#	5"-11½#	9"-20#	12"-30#	15"-55#
	5"-9#	7"-14¾#	10"-25#	15"-50#
16	18	48	60	72
2x⅛	3x⅛	4x1	6x1¼	8x1½
24	36	48	72	96
3x¾	6x1	9x1¼	12x1¾	12x3
20	24	30	36	60
1½-1¼	2-1¾	2¾-2½	3¼-3	5-4½
20	24	30	48	60
1¾	3½	5	.....	.....
2	4	6	.....	.....
1½	2	3½	5	8
1¼	2	3	4½	6
1	1½	2½	3½	5
16	20	24	36	60

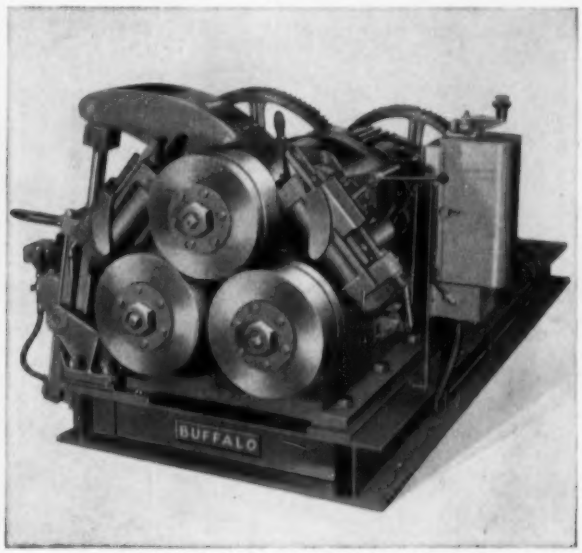
AT PRODUCTION-LINE SPEED



The sections above are easily bent into arcs, circles or spirals, using standard quick-change rolls.



"Buffalo" No. 3 Horizontal Bending Roll forming heavy angles for inside framework of large elevated tanks — rapid fabrication to close tolerances.



New "Buffalo" Vertical Bending Roll with instant release and positioning of work by hydraulically raised and lowered upper roll.

The table at left will give you an accurate picture of the wide range of sections you can cold-form into curved shapes at profitable speeds with the various sizes of "Buffalo" Bending Rolls. These machines are saving money in manufacturing hundreds of products with curved shapes, thanks to these "Q" Factor* features:

- **Instant stopping, starting, reversing by control lever**
- **Quick change, adjustment and release of rolls**
- **Long-wearing rolls of hardened and ground alloy steel forgings**
- **Available with leg-in attachment for angle bending**

Write for full details on all "Buffalo" Bending Rolls, including small Aircraft Type, Pinch-type, and Wrapping Rolls for forming cylinders. Request Bulletin 352.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

509 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

Family Portrait of

PRATT & WHITNEY

Solid Carbide Cutting Tools

but here's what the camera DIDN'T *catch*

It couldn't possibly picture all the many types and sizes of cutting tools in the very complete P&W Solid Carbide line . . . that would take a whole family photograph album. And the photograph doesn't show the years of cutting tool know-how, experience and carbide research that goes into every P&W Carbide Tool (even though it *is* easy to see how this extra quality will save money on your production lines). Out of camera range, too, was one of the most important features of all – the way P&W Engineering Service makes sure that every P&W Carbide Tool you buy is exactly right for *your* specific job requirements. If one picture's worth a thousand words, we believe that one sample of the way P&W Carbide Tools perform on the job is worth a thousand pictures . . . so ask a P&W Cutting Tool Representative to *show* you.

PRATT & WHITNEY COMPANY
INCORPORATED

11 Charter Oak Boulevard, West Hartford 1, Connecticut

Direct Factory Representatives in Principal Cities

MACHINE TOOLS • GAGES • CUTTING TOOLS

their feelings on these matters better than any other individual in the plant.

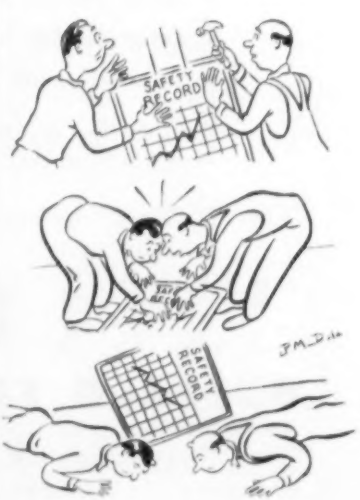
A new man assigned to a department for which he is unsuited can generate many problems which may continue to give trouble even after the man has been transferred. The safest procedure to follow is to leave the final decision to the foreman, the man responsible for the success of the department.

Clifford Molloy
New York, NY

THERE was a time when a foreman's opinion was the best way of judging a man's ability and temperament. Today is an age of specialization, not only on the level of the individuals, but on the organizational level of the company. The modern plant is a carefully planned and integrated group of specialists.

A generation ago the foreman in the shop was king. He not only supervised production, he was the methods man as well. He did the hiring and firing and frequently the purchasing. Of necessity he was a man of mature judgment with wide experience in all phases of shop work. In that era such an arrangement was both possible and practical.

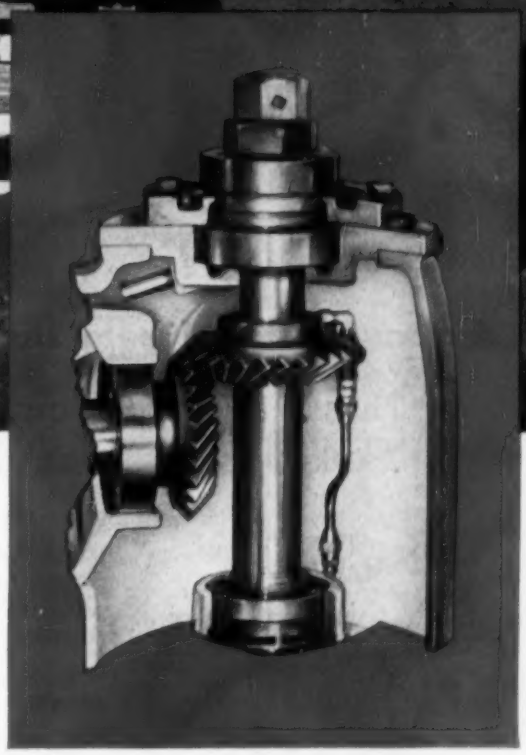
Since that age technical advancements have come at a tremendous rate which is ever increasing. These developments have swelled the field of knowledge at a geometric rate. We are forced to specialize to survive for there is no plan for the man with a little knowledge of a variety of



Turning **POWER** *into* **WATER** *for a million* **THIRSTY ACRES**

Here is work—hard work—needed work, for America's huskiest pumps. Here, where crops and livelihood depend upon them, you will find pumps engineered for the most reliable performance and endurance. One of the strongest points we can make about our gear drives is that they are specified as original equipment in the irrigation pumps of many manufacturers.

What is your power transmission problem? Why not write?



Cut-a-way shows gears of our manufacture in a typical heavy-duty irrigation pump.

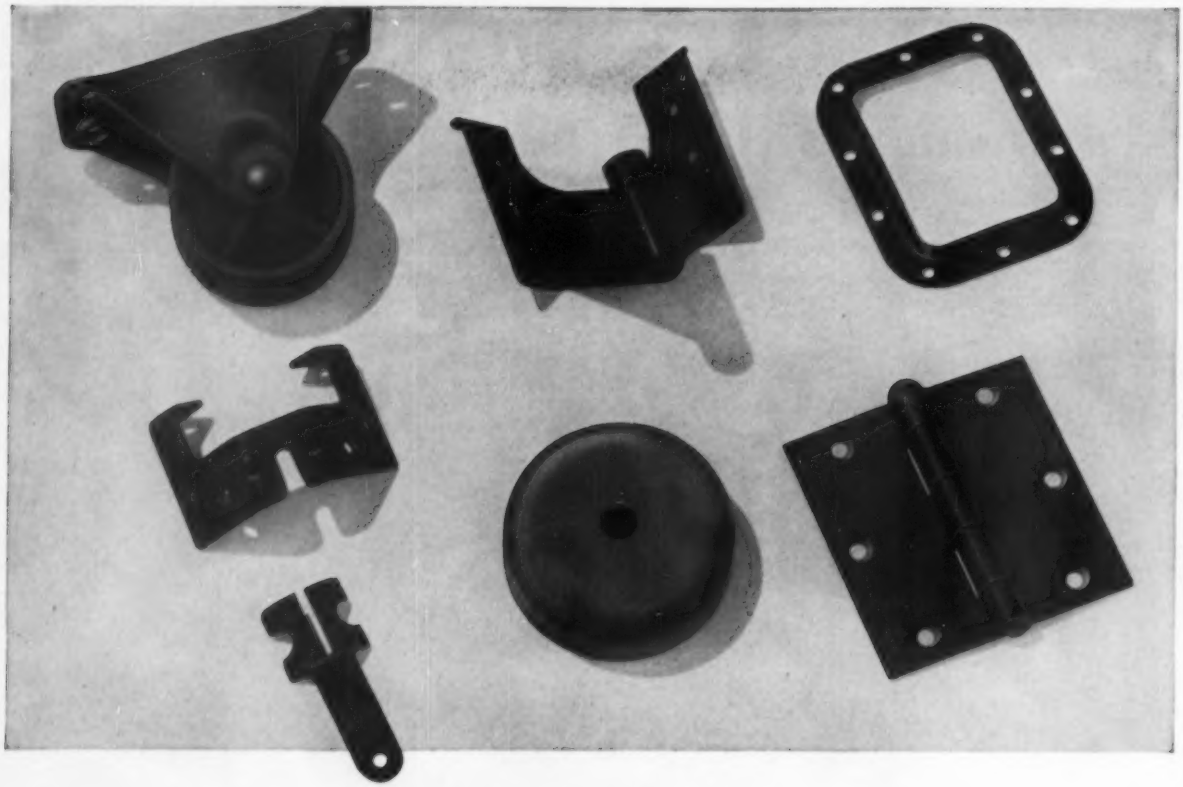
DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

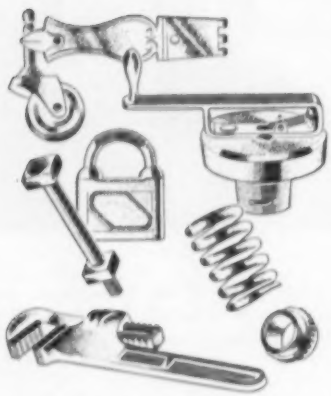
ESTABLISHED IN 1914 — RICHMOND, INDIANA

SUBSIDIARY OF EATON MANUFACTURING COMPANY



A manufacturer of metal stampings* writes:

"There are many outfits offering something like Parkerizing, but we want the real thing."



Some typical parts which are protected from rust by treatment with Parco Compound

Parco Compound† (Parkerizing†) is the original rust-resistant phosphate coating for iron and steel. For forty-two years it has protected hundreds of different types of products—from bolts to boats.

There are other products "like" Parkerizing, but none quite so effective, so dependable, so thoroughly tested and proven.

Parkerizing is simple, fast, and costs very little. It can be used on any iron or steel article which can be immersed in the tanks. Since it does not change the dimensions of the treated parts, it is excellent for threaded or close-fitting components. Parts treated with Parco Compound may be finished with stains, waxes, oils or paint.

You, too, should demand "the real thing." Use Parkerizing for rust resistance.

**Name on request.* *†Parkerizing, Parco—Reg. U.S. Pat. Off.*

PARKER RUST PROOF COMPANY
2196 E. MILWAUKEE, DETROIT 11, MICHIGAN

Since, 1914— leader in the field

BONDERITE corrosion resistant paint base
BONDERITE and BONDERLUBE aids in cold forming of metals
PARCO COMPOUND rust resistant
PARCO LUBRITE wear resistant for friction surfaces
TROPICAL heavy duty maintenance paints since 1883

fields. The man who seeks success does not constantly glance around, he devotes his energies to his selected branch of the work.

Under this system the selection of employees should be left to the personnel department. These people are trained for this and are experts at conducting the all-important interview. They can uncover more information in less time with a reduced possibility of deception.

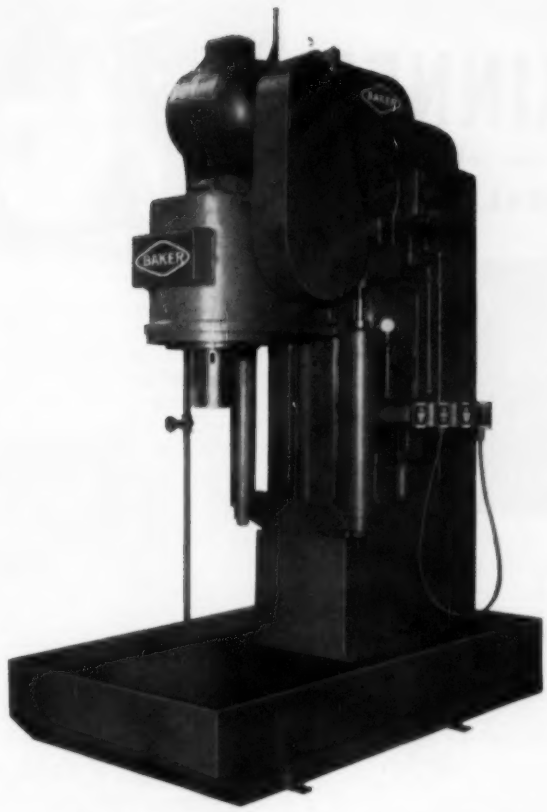
The teaching and training of men is not an activity that requires a highly developed skill at machine operation. What the would-be teacher needs is experience and training in the field of teaching. What shop foreman can claim training in education techniques? As a man becomes more expert as a technician he becomes less valuable as a teacher for he loses that all-important attribute of patience when instructing a clumsy novice. The student cannot absorb his advanced skills; his need is training in the fundamentals, and a little encouragement.

The modern shop is highly departmentalized and the individual foreman does not have the scope of vision to select the best department into which to place a new man. There are men in management positions who have an over-all picture of the plant but they do not have the time or the necessary detailed information to properly place a new man.

Ernest Jones
Bronx, NY

I AM all for the modern methods because, from actual experience, I am convinced that in the case of selection they produce fewer misfits than

"Meet the new bridegroom; his lovey-dovey packs a tablecloth every day with his lunch."



AUTOMATION

that's not "set in its ways"

Automation with Baker Basics is not limited to producing just one part. For Baker Basics are *standard* machines . . . easily retooled for changes in your product or production methods. Cost much less, too, than a specially built machine. So Baker Basic Automation pays for itself even on lower production runs. Yet you still get *full* automation with loading and unloading devices and conveyors, which we can furnish as well as tooling. Use singly or in battery as a transfer machine . . . for drilling, boring, tapping, facing and other machining operations.

BAKER
AUTOMATION
Best in the long run
Practical in the short run

.. Mail Coupon Today ....

BAKER BROTHERS, INC.
Dept. AM-1156
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Please give me the full story on automating with Baker Basics.

NAME AND TITLE

COMPANY

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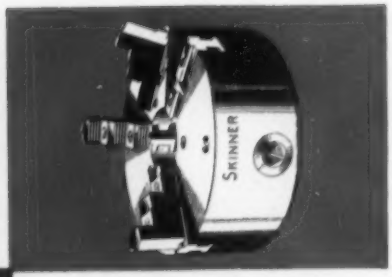
SKINNER

precision self-centering
SCROLL CHUCKS



. . . for long-lasting accuracy and safety!

These powerful chucks are made in sizes from 3" to 18" for light, medium and heavy-duty toolroom jobs and production runs. Each is furnished with two sets of solid jaws, or 2-piece jaws for holding internal or external work. The bodies are forged or semi-steel; all other parts are heat-treated alloy steel. Lands on the jaw, jaw steps and end bites are ground after the chuck is assembled. Chucks available for American Standard spindle mountings and with flat backs for adaptor mounts. Skinner carries a full line of standard soft blank top jaws.

Write Skinner or your Skinner distributor for folder.

THE CREST OF QUALITY

THE **SKINNER**
CHUCK COMPANY
203 Edgewood Ave., New Britain, Conn.

Dependable is the word for

Ruthman
Gusher
Coolant Pumps

Designed simply, with fewer moving parts to wear, Gusher Pumps are the last word in dependability. Pre-lubricated heavy-duty ball bearings require no further attention. There is no priming or packing necessary. Your Gusher pumps give you instant coolant flow from the moment the machine is started. Specify Ruthman Gusher Coolant Pumps.

Illustrated is a Model VH-6 WP Hammond Abrasive Belt Grinder equipped with a Ruthman Gusher Coolant Pump.

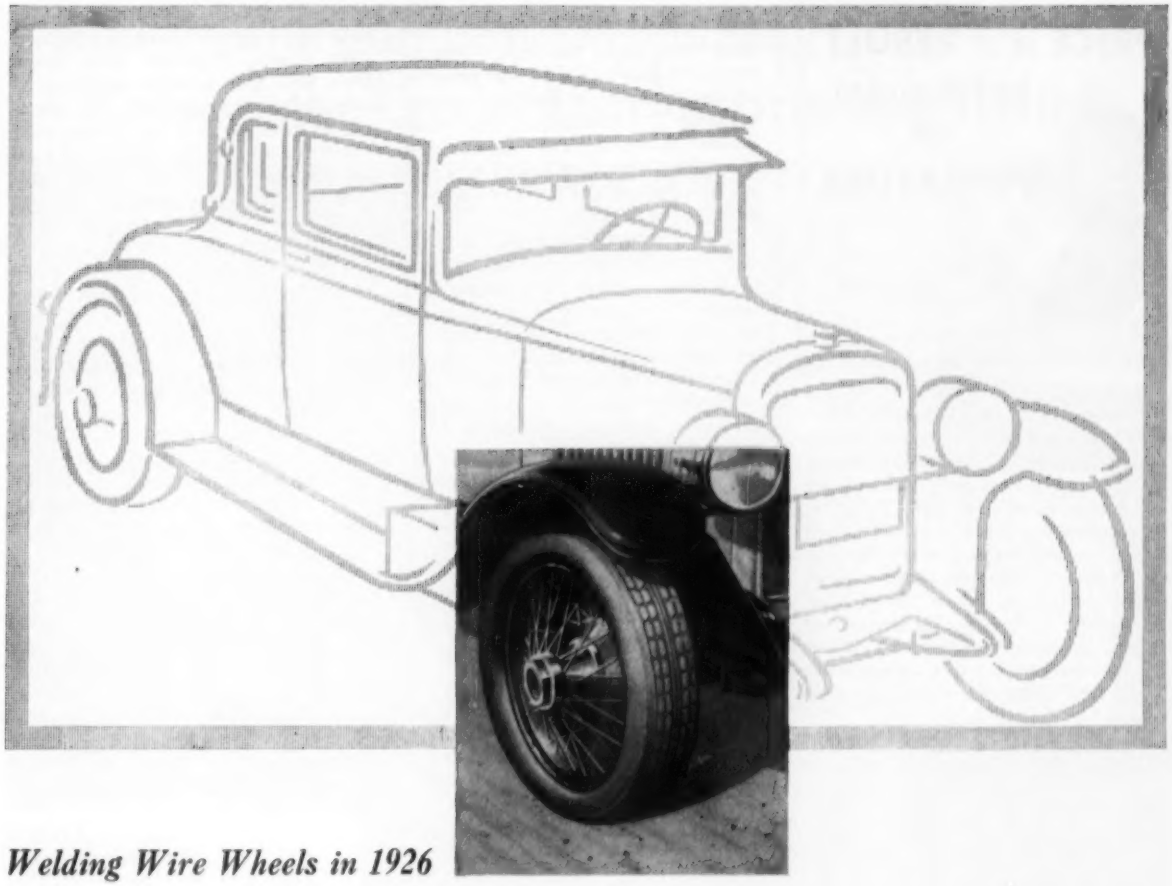
THE **RUTHMAN** MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

do the old methods. Logically, it could not be otherwise. Selecting and training is a part-time occupation for a foreman who has many other things to do. In some works he has too many things to do. The discerning foreman is aware of this and is usually happy to be relieved of activities which others can just as easily and effectively cover. It is common knowledge that many foreman have no aptitude for spotting talent. The modern method takes account of that fault and is out to correct it. There is nothing magical about the process, neither is it a whim of fashion. More or less, it is recognition of the fact that the old method is a failure in the face of present-day demands.

Unfortunately, the old methods are still kept alive by inefficient higher management with a dislike of change Modern, eager, progressive management is alive to the fact that preparing future mechanics to take their place in a rapidly changing world is not a part-time occupation. It is a full-time job to which a great deal more time, thought, and money must be devoted than in the past with its slower tempo and, too often, insular conceptions. Higher management today has received a rude jolt as a consequence of intensive world competition and if the free world is to survive, industrially and economically, due notice must be taken of the revolution which has come upon us.

Ed would seem not to be clear about how training schemes function in those modern times. Perhaps his wounded vanity, his false pride, may have blinded him to the fact that, indirectly, the shop foreman plays an indispensible part in modern training schemes. The writer is concerned

"No point in giving you a raise to make ends meet, Jespers. Your wife would only move one of the ends."



Welding Wire Wheels in 1926

Helped MALLORY Learn Better Ways to Solve Your Welding Problems Today

THIRTY YEARS AGO, a leading auto manufacturer (still a leader today) ran into a serious production bottleneck in resistance welding of wire wheels. The copper dies being used wore out so quickly that costs were too high, production too slow.

Elkonite®, a material developed by Mallory, looked promising for this application. It was tried . . . and the results were excellent. Die life increased tenfold. And production was freed of stoppage troubles.

This development marked Mallory's entry into the resistance welding field. It has been followed, in succeeding years, by a continuous stream of contributions to welding technology. These are some of the major milestones in Mallory progress:

Specialized alloys, like Elkaloy® A, Mallory 3, Mallory 22 and many others, which provide a family of materials engineered for the specific needs of welding service.

Fluted electrodes, which greatly increase electrode life.

Cold forming methods for producing bent electrodes with greater hardness and strength.

Special holder designs to meet the needs for higher pressures for large welding machines, and low pressures for non-ferrous alloys.

The knowledge gained during three decades of pioneering activity and constant development stands ready to serve on your own resistance welding problems. Write or call Mallory for a personal consultation by a Mallory welding engineer . . . and see your local Mallory welding distributor for prompt delivery of the best in welding electrodes, holders, seam welding wheels, forgings and supplies.

30 Years of Welding Progress

P.R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

PRICE is a **RESULT**
not a point
of
DEPARTURE

Anthony Lucas

METHODS MGR., THE CINCINNATI GEAR CO.

My department is called "Methods," but it actually covers a lot more ground than the title would indicate to the average person. Methods' task is to carefully plan each job that is to go through our plant . . . lay out the operations required, in order and through the various machines indicated for that particular job . . . choose the correct material, in the correct form, and the type of blank for the job . . . determine the type of heat treating or finishing required . . . estimate the time involved for each operation, the cost of each ingredient in the manufacturing process.

After all this is completed, and *only* after it is all completed, then we give our Sales Representative a price to quote to you the customer. All this must be done before we have any assurance that your order will be placed with us.

We never "guesstimate" a price; and once we receive your order, we are not compelled to resort to juggling to make the final price come out like the quote. It is my responsibility to make certain that our quote will reflect the *actual cost* of what we feel will be the right gear for the job — made of materials and by a sequence of operations that will produce for your particular application the *gear of lowest ultimate cost.*

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
"Gears—Good Gears Only"

CINTI®

with one which actually appoints the shop foreman as the final judge of each new man's quality and progress on the practical or shop side of his training. The theoretical side is attended to by a team of qualified specialists. The shop training is similar to the method Ed favors, with slight modifications.

The training specialists get the new men, vet them and classify them according to their intelligence quotient which is arrived at by means of general intelligence tests. Suitable men are given simple detail drawing lessons and instructed in the reading of drawings. They are also given instruction in simple arithmetic. Those who can, take it, continue with high er theory, eventually qualifying for some form of leadership. The others are taken as far as they can go in theory and are classified as machinists, fitters, etc. No attempt is made to teach the practical side beyond making the men familiar with the usual shop terms, the use and care of fine tools and machines and the importance of safe working, etc. So far as is practicable, a man is encouraged along the lines for which he expresses a preference and as high as ninety per cent make good at the work of their choice.

The shop foreman is given a questionaire for each man every six months and his answers are compared with the findings of the specialists who compile identical data at the training center. Disagreement between the two is investigated and a remedy agreed on. The purely practical training is given in the shops under the supervision of the foreman. The scheme is not foolproof, but it accurately and systematically fixes values for each man, giving each much more individual attention than a shop foreman could spare time for. The benefits attached to centralizing and organizing the training of new men are so obvious that one wonders why the wisdom of such an arrangement should be seriously challenged. By comparison, the old method which Ed extolls whereby the foreman selected and trained in his spare moments is haphazard and inefficient in the light of present-day requirements.

Even in less exacting times, the method suffered from internal strains and stresses. One recalls the high percentage of skilled men without so much as an elementary knowledge of drawing, not to mention the foremen who had practically no knowledge of how costs were arrived at, how estimated production times were calculated, or how piecework or bonus systems were operated. This is not in disparagement of the old-timers who, in many ways, were wonderfully adroit in overcoming the disadvantages arising from a scanty preparation for the demands of industry. It is written in the confident belief that the methods of the past are wholly inadequate for the present—fantastically so, if we look beyond the present.

J C Ball
Stranraer, Scotland

"—Act like you belong to management and you're about to hear my reasons for more money!"

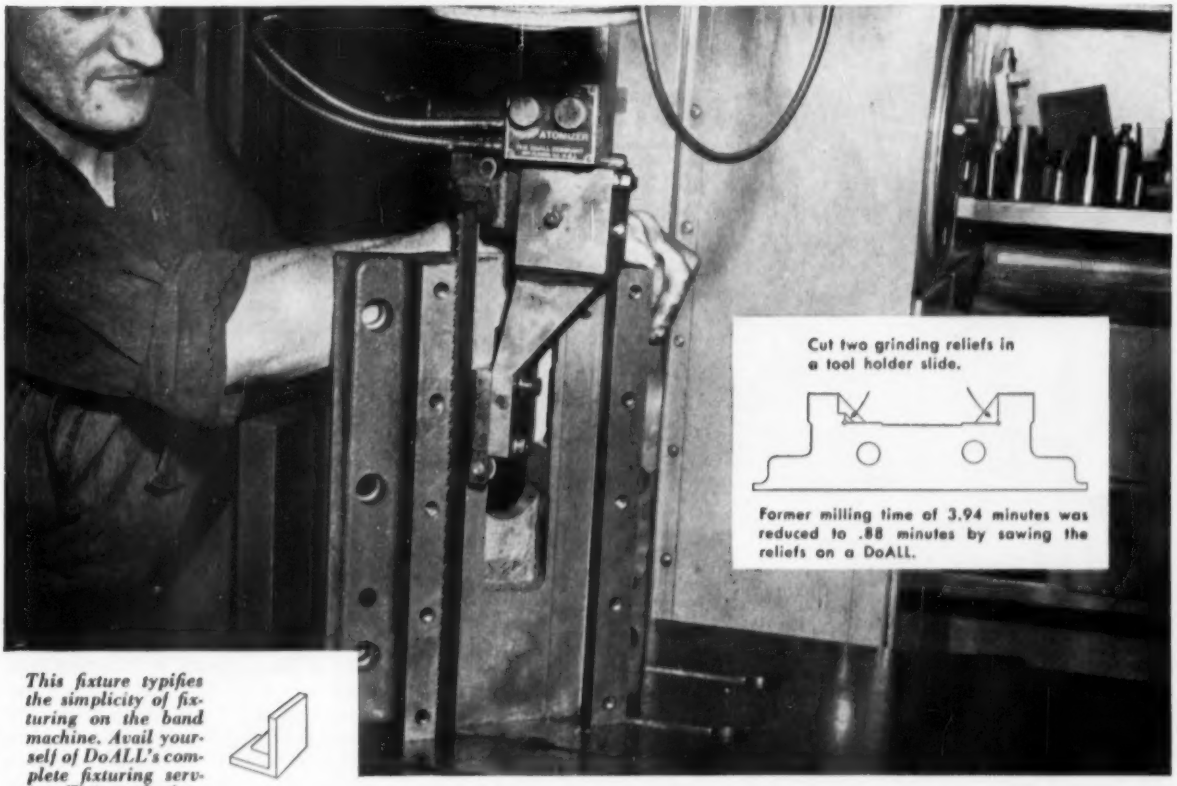
TICK-TOCK TRIG

Would it help shop figuring if all calculations for angles were in degrees and decimals of degrees, or is the established system with minutes and seconds too firmly entrenched?

MANY years ago I worked for a company who changed management on the average of every six months. Each new manager had a different view of the rules and policy of the company. We would have procedures and policy with each change. After several years of this we did not know if we were coming or going. There was discord and resentment between the various departments, also between staff and line. We had a little bit of everything—whip-cracking, face-slapping, enforcing, driving, buck-passing and molly-coddling.

These kinds of changes eventually kill incentive and personal ambitions. Many of these changes were of a radical nature, and not in line with present-day management policy. Some of the department heads rode with the various changes for several

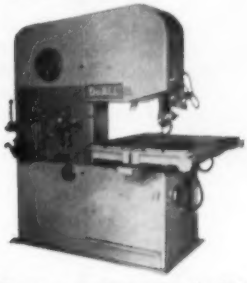
How Production Band Machining Reduces the Cost of Cutting Grinding Reliefs



Cut two grinding reliefs in a tool holder slide.

Former milling time of 3.94 minutes was reduced to .88 minutes by sawing the reliefs on a DoALL.

This fixture typifies the simplicity of fixturing on the band machine. Avail yourself of DoALL's complete fixturing service. Write today!



This Contour-matic is a standard design machine modified by DoALL to provide extra work height capacity required for this job. DoALL can fit your requirements, too.

Manufacturer Does Job in ¼ the Former Time . . .

In search for new cost cutting methods, one manufacturer found that major savings could be made in machining grinding reliefs, simply by switching the job to a DoALL Contour-matic band machine.

Results: Reliefs that formerly took 3.94 minutes on a milling machine were produced in 1.33 minutes on a DoALL Contour-matic with a carbon steel saw band. Changing to the new Demon H.S.S. saw band, the time was further cut to .88 minutes, for a time saving of 78% over the former milling time. One operator now does in one hour what formerly took 4 hours!

Reasons: The continuous cutting slender saw band penetrates the metal much faster than possible with other methods. Too, the cutting force is directed downward only, thus eliminating costly hold-down fixtures and lengthy set-up time . . . only a simple back-up bar is needed.

Cutting grinding reliefs is just one of the many production machining operations that can be done faster at lower cost with a DoALL. For information and a free, in-your-plant demonstration of this new, basic production tool, see your local DoALL Sales-Service Store or write:

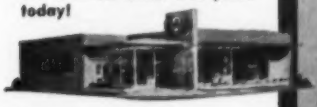
THE DoALL COMPANY, Des Plaines, Illinois

The Demon H.S.S. saw band developed by DoALL is the world's fastest cutting, longest lasting saw band.

DoALL

FREE LITERATURE AND MOVIES—Ask for the new 16-page band tool catalog and Contour-matic catalogs. See in sound and color, "Production Band Machining" (30 minutes) and "Production Tooling" (10 minutes)—both available for group showings.

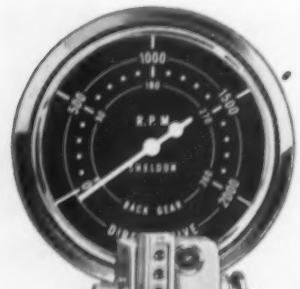
Friendly DoALL Sales-Service Stores in 38 cities. Call yours today!



78-31

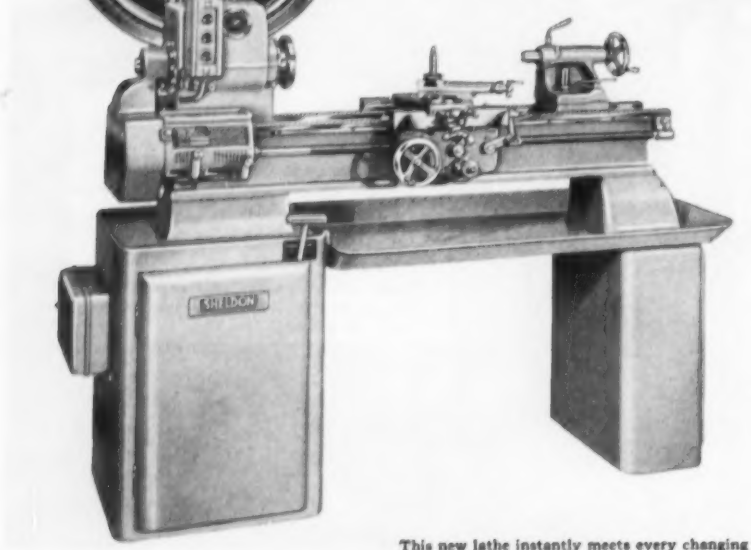
SHELDON *Variable Speed* PRECISION LATHES

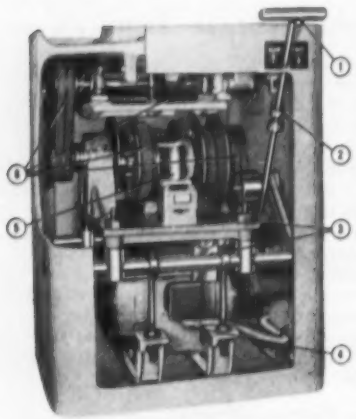
CHICAGO U. S. A.



. . . any speed INSTANTLY*

** Spindle speeds changed at 100 r.p.m. per second. Built-in tachometer permits accurate selection of speeds from 300 to 1800 r.p.m. in direct drive—40 to 300 r.p.m. in back gear.*





(1) T-Handle Speed Selector
(2) Micro-Switch Direction Control
(3) Speed Change Mechanism
(4) 2 H.P., Three Phase Motor
(5) Belt-tension Adjustment
(6) Multiple V-Belts

This new lathe instantly meets every changing speed requirement in the tool room, or quickly sets and holds to any prescribed speed for production runs.

Rugged, Heavy-duty Variable Speed Drive—an oversized unit with double V-belts throughout that delivers positive full-power to the spindle.

High Spindle Speeds—from 300 r.p.m. to 1800 r.p.m. (direct drive), from 40 r.p.m. to 300 r.p.m. in back gear.

Instant and Automatic (power driven) Speed Selection—Only 9 seconds to change from low to high speeds in either direct drive or backgear. Speeds are changed automatically when T-handle is lifted or pushed into engagement.

High Horsepower at All Speeds—Because the drive unit is oversized, it has larger belts which deliver maximum gripping power at all speeds. A 2 H.P., three Phase motor recommended.

Additional lathe features: Zero Precision tapered roller spindle bearings, 54 pitch gear box, heavy cast pedestal, tool-room accuracy. Optional accessories include hardened bed ways, L00 long taper key drive or 4" D1 Camlock spindles.

Sheldon Precision Variable Speed Drive Lathes are available in 11" or 13" Swing. Model WM-56-P (Illustrated) less motor and switch, $1,944.00 F.O.B. Chicago. Other 10", 11", and 13" Sheldon Precision Lathes from $832.00 up. Also 13" and 15" Sebastian Geared Head Lathes, Sheldon Milling Machines and Sheldon Shapers.

Write for Catalog

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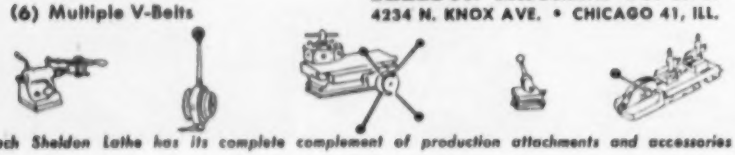


Each Sheldon Lathe has its complete complement of production attachments and accessories

years, hoping for better conditions. Finally several of them resigned in a short space of time.

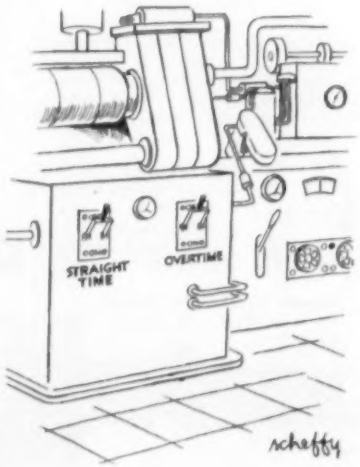
This so-called tick-tock trig is not so hard to take. It makes little difference what standards you use so long as they are made uniform. Changes are not hard to take if you know and understand the reason for them.

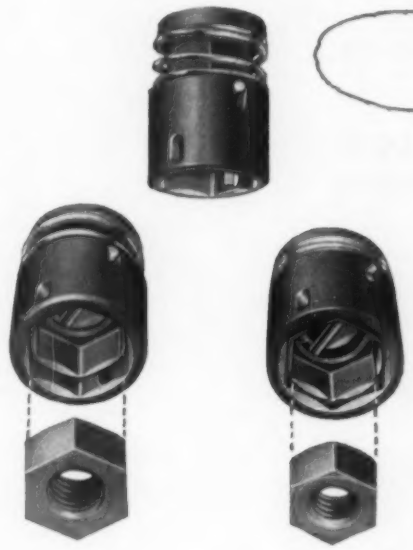
In many cases someone decides to make a change and that's it. No one is notified. This causes resentment. I don't claim that employees should be consulted about management affairs. No one should question management's right to manage. But employees should be notified in advance of major changes.

A E Salmons
Norristown, Penna

MINUTES and seconds of angles are as clumsy and awkward as Roman numbers and should be relegated to the museum. Wine, violins, and friends improve with age but minutes and seconds of angles remain a nuisance and become more and more out of date as improvements in techniques and methods are made.

This method of designation with the degree, minute and second symbols may look attractive on the drawing but try using them in arithmetic manipulation. For example, dividing 59° 50′ 8″ by 6 requires addition subtraction and multiplication. Before the 5° left over from the 59° can be added to the 50′ it must be multiplied by 60 and then carried over. Each operation of this manipulation offers a chance to make an error. The same unweildiness occurs when adding or subtracting angles





This Apex "2-in-1" spring-loaded impact socket is used interchangeably to run down ¾" and ⅞" hex nuts on automobile engines. It eliminates constant changing of tools, helps step up production. As an additional feature, socket may be turned end for end to double working life.

This Apex Spanner-type socket has four internal driving lugs to engage the four openings in the flange-type nut. It eliminates the customary external prongs that frequently break off and slow down assembly operations. Socket seats nuts quickly and easily in a difficult location inside an automatic washer.

The true cost of any tool will show up in production records, not just on the price tag. The amount of work a tool can do efficiently is far more important than the original tool cost.

For example, each of these special Apex sockets was designed to solve an unusual fastening problem. For this reason alone, these tools have proved well worth their original price. In addition, these tools have provided substantial savings in production time and expense—that's why the true cost of Apex tools is always lower.

When your production or maintenance work involves nut running or screwdriving, you can keep costs down with Apex tools. There are more than 7,500 stock types and sizes of Apex tools for every nut running or screwdriving job. And, if yours should be a special fastening problem, we'll work with you to develop a special tool exactly suited to your needs.

Apex—the authority on fastening—offers creative engineering and specialized manufacturing experience that will help solve your fastening problem. Our new Pocket Catalog is ready—may we send you a copy?

Ask **APEX** *for the answer to your fastening problem!*

THE APEX MACHINE & TOOL COMPANY

1026 S. Patterson Blvd. • Dayton 2, Ohio

new FOR OPTICAL GAGING

MULTI-USE FIXTURE PROVIDES LOW COST STAGING FOR MANY SMALL PARTS

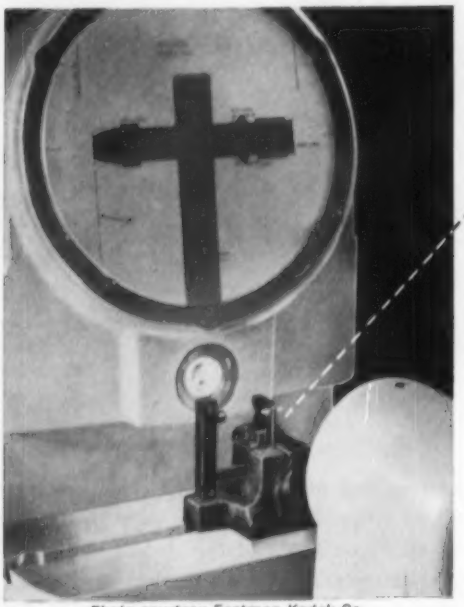
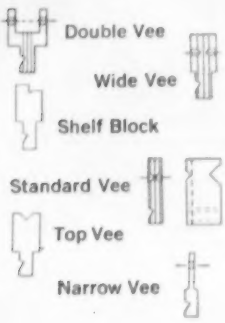


Photo courtesy Eastman Kodak Co.

O. G. P. Multi-Use Fixture fits all types of optical comparators.



O.G.P's NEW Multi-Use Fixture has replaceable part holders designed for holding many types of small parts. Standard holders in varying sizes and shapes are available (see drawings above). Quickly locks into keyway with clamp.

EVERYTHING TO MAKE YOUR OPTICAL COMPARATORS MORE USEFUL

We also supply all types of standard charts, custom charts, layout accessories, fixture bases, and custom fixtures to meet your specialized requirements.

USE THIS COUPON TO GET HELPFUL INFORMATION

OPTICAL GAGING PRODUCTS, INC.
26 Forbes Street, Rochester, New York
I'd like more data on the NEW O. G. P. Multi-Use Fixture.

Name ..... Title .....
Firm .....
Street and Number .....
City ..... State .....

OPTICAL GAGING PRODUCTS, INC.
SPECIALISTS IN PROJECTION GAGING

expressed in degrees, minutes and seconds.

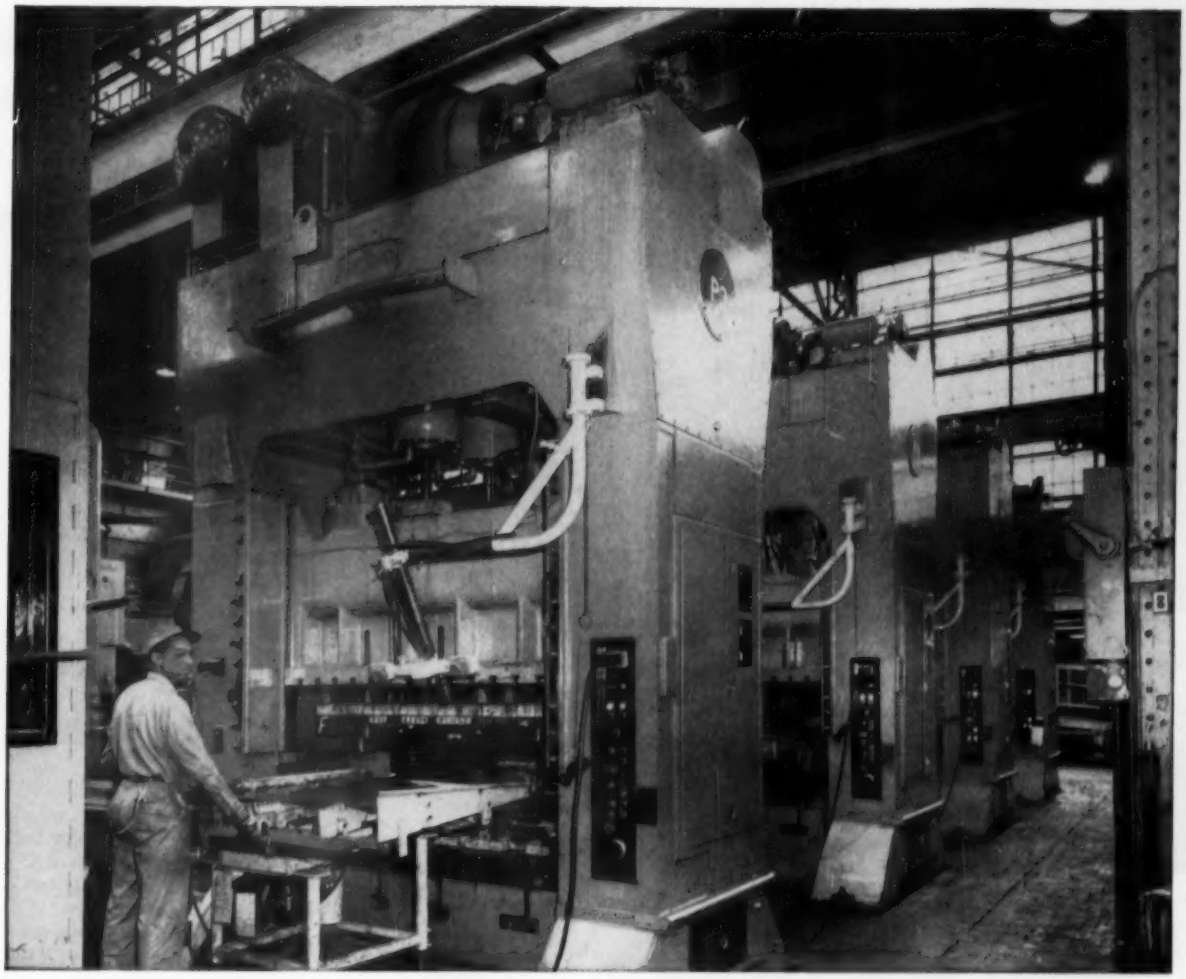
Compare this with the method of writing angles in degrees and decimals of degrees. The calculations are direct and straight-forward with a saving in time and a reduction in the possibility of an error. True, the oldtimers in the shop are familiar with angles written as degrees, minutes, and seconds but this is a poor excuse for retaining an out-moded form. Does an organization refrain from purchasing a new machine tool because the employees are used to seeing overhead shafts and belt shift levers?

Human beings are creatures of habit and like to stick to the ways to which they have become accustomed. Habits are time-saving devices and make it unnecessary to relearn repeated operations, but how long does it take to become acclimated to writing, reading and working with angular notations presented as degrees and decimals of degrees! The degrees are still written as degrees in exactly the same manner, the only change being after the decimal point, so the concept and meaning of a degree and the relative size and relation of angles are unchanged. A few minutes of instruction, a simple demonstration, are sufficient to acquaint the average shop man with this method of delineating angular dimensions.

There are always a few diehards who cannot see any way but their way, who fight any change from the old way. However they can be made to see the light and to use the decimal notation even if they do so grudgingly at first.

The great mass of teachers, learners and doers contribute but little

"This is a sheet of our new lightweight material I was telling you about."



Dependable CLEVELAND Presses Hold Automotive Stamping Costs Down!

These four Cleveland Presses recently installed at a leading automotive stamping plant are further testimony of the dependable performance built into every Cleveland Press. Their selection clearly indicates their ability to produce low cost stampings on high production schedules . . . indicates their ability to "stand up" under the demands of round-the-clock operation.

You, too, can earn extra profits by investing in new, more efficient Cleveland Presses. You'll find that the instant response and exact control made possible with the patented Cleveland Clutch speeds operation . . . reduces rejects. Their extra rugged construction assures reserve capacity . . . lasting slide alignment for continued accuracy. One of the 11 specialized types of Cleveland Presses is sure to be your answer to greater stamping economy. Write or call today!

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to RACES...

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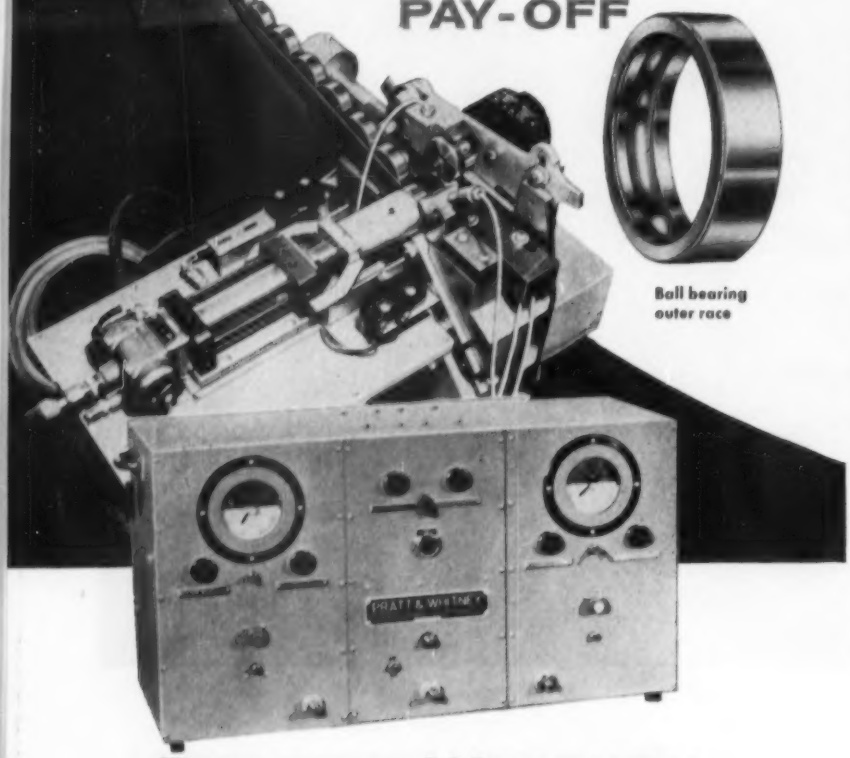
AUTOMATIC **3**-to-**1**
FAVORITE for a

BIG
PAY-OFF



Ball bearing
outer race

PRATT & WHITNEY
AUTOMATIC GAGING

If you're looking for the best bet in Quality Control, you can really "chute" the works on this outstanding new performer. Pratt & Whitney "In-the-chute type" Automatic Gages can handle the output of several high speed automatic machines.

Races fed by chute into the gage unit are checked for 3 dimensions at 1 time — size and taper and out-of-round at a rate of 2200 pieces per hour and automatically sorted into ok, undersize and oversize categories. If limits are exceeded, the Gage Unit automatically signals that a machine correction is required.

DON'T GET LEFT AT THE POST... in the industry-wide race to produce better and faster at lower cost. Learn *now* how P&W Automatic and Automation Gaging can put you out ahead of the field. Phone the P&W Branch Office near you and ask a Pratt & Whitney Gage Specialist to call ... or write direct to West Hartford outlining your needs.

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MACHINE TOOLS • GAGES • CUTTING TOOLS

or nothing to the world's progress. They do the world's unoriginal work and they forward its heritage from one generation to another but add nothing to it. In the slow laborious progress of mankind whole nations went on for generations in complete stagnation. Each new generation learned to repeat the ideas and ways of its parents. They performed their tasks just as their ancestors did before them. It was not that they lacked intelligence for they had their share of men of knowledge. Their sages knew the history of the nation and their craftsman could fashion their tools and their needs. But all this ability was purely repetitive; it never occurred to them to change, to improve, to experiment. They were content and fought against change. If and when an advance was made it had to be forced on them by a creative mind.

The adoption of any improvement must of necessity be made at the expense of the old method, but why perpetuate an antiquated habit? The expense of the change-over is temporary, the profit continues on into the future.

Any organization that fails to adopt degrees and decimals of degrees and continues to use minutes and seconds is overlooking a profitable improvement. A change-over to degrees and decimals of degrees will save time in writing and reading, and will reduce confusion and errors.

William Martin
Brooklyn, NY

TAIL-END CHARLIE

Is it fair to pass over a man for promotion because of frequent absenteeism and tardiness, particularly if he has seniority rights to the job?

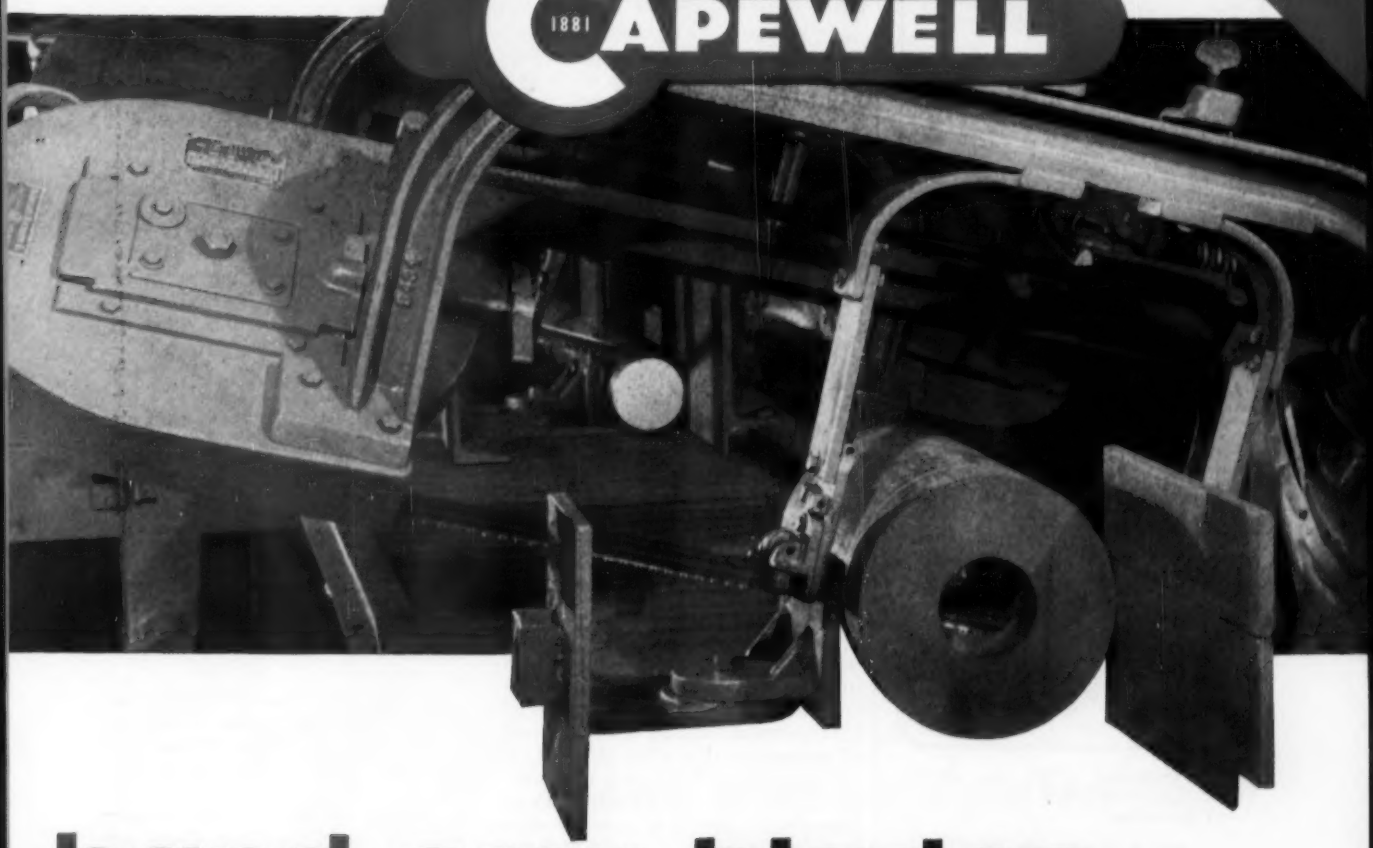
STUDIES have shown that tardiness and absenteeism are costly traits to industry. Experiment has illustrated

"Look, if you're smart enough to read, you'll never make it!"

cut it with

stop

1881 CAPEWELL



band saw blades

THE USER: Taywood Steel Products, Inc., Bell, Calif.
THE MATERIAL: A. Milne & Co. Solid and Hollow Tool Steels
THE JOB: Minimum 1/32" saw cut waste
THE PROBLEM: To eliminate uneven cuts and short blade life
THE ANSWER: Capewell Cravenized Metal Cutting Band Saw Blades
THE RESULT: Extreme accuracy—many cuts per blade—faster cutting

Capewell Band Saw Blades can give you production bonuses, too. Available in regular, skip or shark tooth design, Capewell blades stay sharper longer and give more cuts per blade. Tooth by tooth, Capewell blades are a superior product, manufactured to rigidly controlled specifications—insist on Capewell for proved maximum saw performance and production economy.

75 CAPEWELL ANNIVERSARY

SOLD ONLY THROUGH
CAPEWELL DISTRIBUTORS
who provide: complete inventory
. . . engineering assistance
. . . delivery when you need it.

THE CAPEWELL MANUFACTURING COMPANY
Hartford 2, Connecticut

Please send complete details on Capewell Band Saw Blades to:

NAME_____
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CA56A

These are typical of the many piece parts being balanced on the *low cost, high production*

TAYLOR

HI-EFF

BALANCING MACHINES with SPEED BUTTON CONTROL

Send your piece parts for sample balancing or drawings for recommendations by Taylor engineers.

TAYLOR DYNAMOMETER and MACHINE COMPANY

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INTERNATIONAL DIVISION—DUMMANN WORLD TRADE CO., Milwaukee 6, Wisconsin, U.S.A.

the fact that the company is at a disadvantage unless employees are penalized for such habits.

When a supervisor is to decide on a promotion, all other facts being equal, he makes the economical choice when he advances the man who spends the most time on the job. As a 10 o'clock scholar advances to a higher income bracket, management bears a greater loss when paying for work not performed.

Many great men attribute their success to having been on the job before the appointed hour. C H Spurgeon became famous for having advised, "Better late than never, but better never late."

Neal A Mack
Belle Harbor, NY

UNDERSTANDING and cooperation between employees and employers are of the utmost importance to the success of all industrial production. It requires good workmanship, high morale and good attitude.

Employers today recognize a supervisor is not only a cog in the machine, he is a part of the business. Finished products must be exactly right, not almost right. We can allow no margin of error.

Many good qualities are necessary in successful running of the business. Company loyalty, pride in work, dependability and healthy work attitudes are a must. A poor on-time and attendance record is none of these.

In this problem I would pick Bob for the promotion regardless of seniority. Company rules state clearly attendance and on-time go into the records. I don't think Al has to worry about giving the promotion to Bob. The fact that Charlie did not read the handbook regarding the rules shows a lack of interest in the job.

A E Salmons
Norristown, Penna

"What little thing-a-ma-jig fell off the machine a while ago that you didn't consider important?"

AL, the foreman, is in a difficult position trying to decide between Charlie or Bob as the new group leader. It is easy to criticize a man when he is in a jam, but I believe that a good deal of the blame for this dilemma can be traced to Al's negligence.

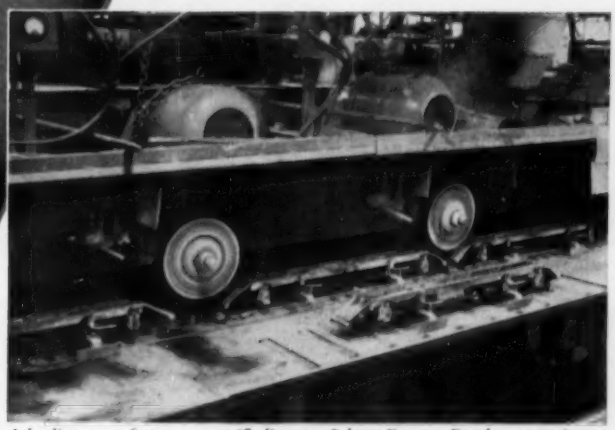
Charlie has been late and absent repeatedly and Al was lax and neglectful of his duty in failing to reprimand him. It is the old story of one's sins coming back to haunt one. Al's failure to take the proper action can be taken as a condonement of Charlie's attendance record. Unless a rule or a law is enforced it becomes just another piece of paper. The significanse and strength of a regulation results from firm, diligent enforcement, not from stagnant existence.

Al should have taken sufficient interest in his man Charles to attempt to determine the cause of his poor attendance record. The supervisor may feel that it is no concern of his to meddle in the life of the worker after he leaves the plant. There are good arguments in favor of divorcing the employee's outside life from his activities in the plant, but no one can deny that they strongly influence each other. The foreman should not overlook the fact that maladjustment of the man at his work may have its origin elsewhere. There may be any number of reasons why a man has developed a habit of arriving late and being absent frequently. He or a member of his family may be ill or he may be faced with financial worries. If he is a young man he may be undergoing the upsetting experiences of a confused love affair.

The foreman who is a real leader and not just a boss will make an effort to obtain the confidence of his men. The progressive foreman with insight can uncover these causes by judicious and tactful inquiry and by assisting to straighten them out, restore the maladjusted worker to the ranks of the useful and contented employees.

A foreman or supervisor does not

(Continued on page 242)



A leading manufacturer uses 16" diameter Osborn Fascut® Brushes, operating at 1700 rpm, to finish automotive trim parts prior to plating.

Smooth start for a perfect finish

THE bright smoothness of metallic trim—adding a final touch of beauty to thousands of products—must start with an equally smooth surface prior to plating.

Makers and users of trim parts find Osborn power brushing methods ideal for removing draw marks, blending imperfections into an unmarred plating surface, materially reducing rejects.

An **O**sborn **B**rushing **A**nalysis, made in your plant and at no obligation, will point out the many ways Osborn power brushing can improve your metal finishing operations. Write *The Osborn Manufacturing Company, Dept. C-57, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

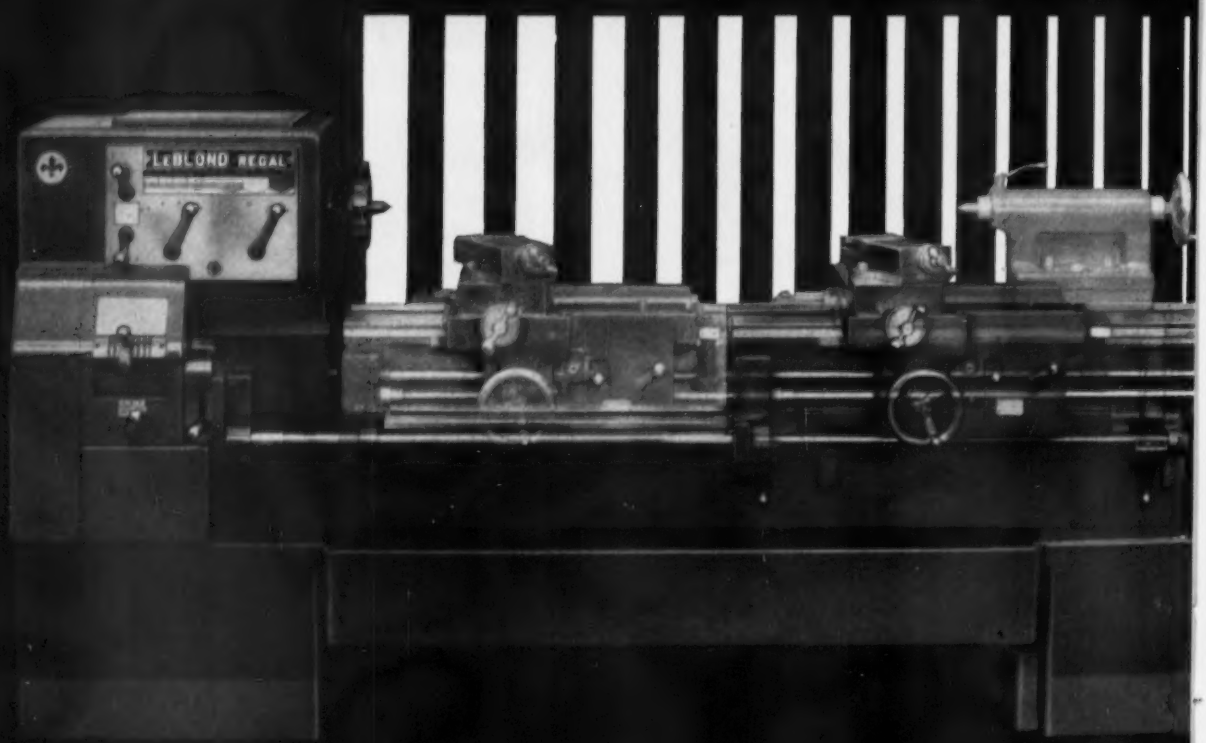
OSBORN®

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

Osborn Brushes

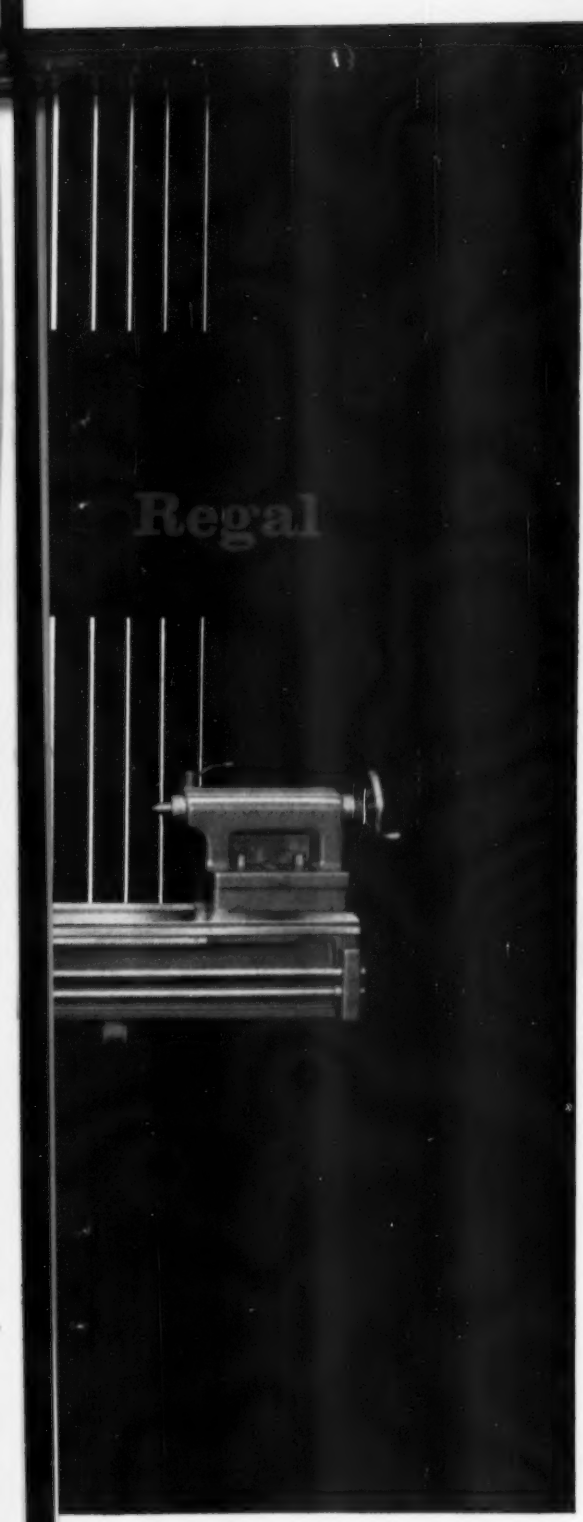
Capacity on a sliding scale

New LeBlond Sliding Bed Gap



Also available . . .
New Plain Gap Regal

Greatly increased swing size to accommodate work with flanges up to 35 inches in diameter. Also performs all normal lathe operations, including close-to-the-face-plate facing.



With the LeBlond Sliding Bed Gap lathe you break out of "small lathe" limitations—enjoy added capacity and versatility normally available only in much larger, more expensive lathes. On the Regal 17″/28″ SBG, the upper bed slides away from the headstock, quickly converting a 17″ lathe to a 28″. Up to 35 inches of swing is provided for work with large flanges or eccentric projections. Center distance increased over 50% with the bed extended.

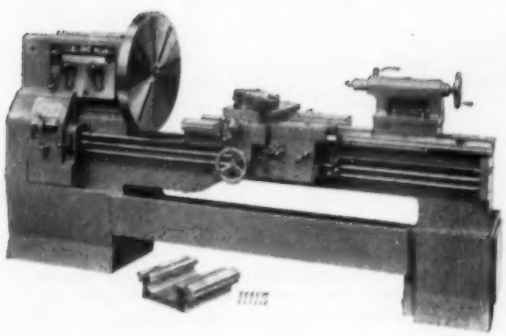
For the maintenance or job shop encountering workpieces of widely varied size and shape, the Regal Sliding Bed Gap lathe offers the ideal, low-cost answer.

Regal performance matches its increased capacity, too. The new 12-speed, gear-belt headstock with its 3-bearing spindle delivers power with precision. The extra wide carriage bridge, riding on hardened and ground steel bed ways, gives staunch tool support. 56 speeds or threads can be selected with the foolproof, self-lubricating quick-change box. Separate feed rod and leadscrew guarantee continued thread chasing accuracy.

Regal Sliding Bed Gap Lathes can give you the double advantage of a regular engine lathe *plus* a special purpose machine tool. Also available in 19″/28″ size. Put them to work for you. See your LeBlond Distributor or write.

. . . cut with confidence

LeBLOND
of Cincinnati

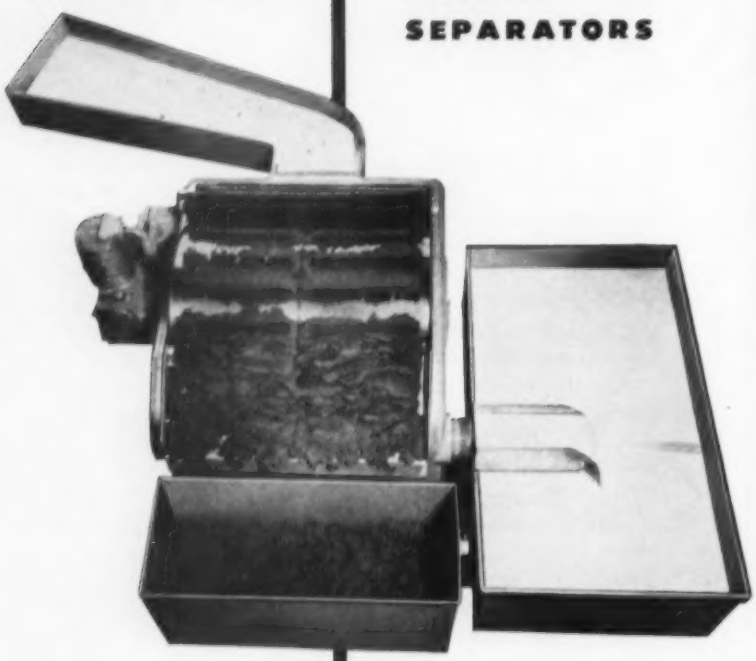


THE R. K. LeBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

World's Largest Builder of a Complete Line of Lathes for More than 70 Years

BARNESDRIL

Magnetic
COOLANT
SEPARATORS



give you these features for

Practical
COOLANT
CLEANING

✻ **AUTOMATIC** — The Separator requires no attention other than periodic emptying of the sludge pan.

INTENSE MAGNETIC POWER — coolant flow is restricted to intense magnetic field so that more ferrous material, entrained abrasives and other foreign matter is removed per minute per gallon than by any other method.

DOUBLE CLEANING ACTION — magnetized particles form a fan-shaped pattern on the surface of the magnetic drum which serves to "comb out" free abrasive or other materials as the drum rotates.

RAPID SEPARATION — coolant is processed rapidly, flowing by gravity through the separator, for effective circulation at all times. No additional coolant supply necessary to compensate for the cleaning operation.

See your Barnesdril representative or write for Catalog 3004.

Barnesdril Automatic Coolant Separators remove swarf, sludge and abrasive particles automatically from soluble and oil coolants. Built in ten sizes — 1½, 3, 5, 10, 20, 30, 70, 100, 280 and 350 gallons per minute capacity.

COOLANT BARNESDRIL CLEANING

BARNES DRILL CO.
830 CHESTNUT STREET • ROCKFORD, ILLINOIS

have to be a graduate psychologist to see the benefits that would arise from giving each employee 15 minutes to reply to such questions as "What are you working for?", "What are you looking forward to during the next five years?", "If you were made works manager tomorrow what is the first improvement you would introduce?", "What is your biggest worry?" One does not have to be a trained psychiatrist to ask such questions and listen with attention and interest to the replies.

The profits of such a system are both direct and indirect. The worker profits indirectly by getting his gripes off his chest, the pressure of his resentments released, and by having his individuality recognized. The foreman profits by having a better understanding of his men.

Al should see his present problem as an indication of a laxity in the performance of his job. If it makes him take a greater interest in his men it will have served a valuable purpose.

Ernest Jones
Bronx, NY

I QUIT . . . NO; YOU'RE FIRED!

Is a company justified in firing a man who announces he is going to leave without giving ample notice? If the company has fired workers in the past, without any notice, shouldn't it expect the same treatment?

AGREEMENTS between employers and unions are binding and must be observed by all parties to the agree-

"I can't make sense out of this requisition of yours—you want more handles on your machine?"

P&H **Welding Positioners give you**

EXTRA CAPACITY

for BIGGER PRODUCTION SAVINGS

Exclusive P&H design features permit handling greater positioning loads for every dollar you invest

Positioned welding is *downhand* welding that permits your weldors to use larger, hotter rods for higher deposition rates. This extra welding speed and the savings in handling of weldments cut welding costs as much as 50%.

When economies like this are possible, it pays to get P&H positioners. Size for size, they can handle the widest range of weldments — give you the greatest capacity per dollar invested. The chart below compares the load capacities of positioners in the 3000-lb. class and proves the extra value of P&H.

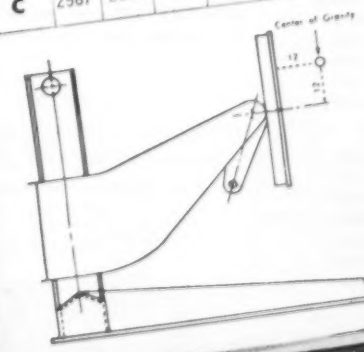
This extra-capacity advantage is found in all sizes of P&H positioners. A free load-capacity table is available to help you select the model best suited to your needs. Just send in the coupon.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

3000-LB. MODELS
LOAD CAPACITY COMPARISON CHART

Capacity Shown Below at 12" off center of Rotation and Distances of Center of Gravity of Load from Table.

Positioner	12"	18"	24"	30"	36"	42"	48"	54"	60"
P&H	**3000**	**2510**	**2160**	**1900**	**1690**	**1520**	**1390**	**1270**	**1180**
A	3000	2000	1500	1200	1000	—	—	—	—
B	3000	2250	1800	1500	—	—	—	—	—
C	2987	2187	1725	1424	1212	1056	935	839	760



I'M SMOOTHARC SCOTTY...and I'm always looking for ways to save money. That's why I like the extra capacity of P&H positioners. Our FREE load-capacity table will show you why.

SEND COUPON TODAY FOR **FREE** INFORMATION

P&H **HARNISCHFEGER CORPORATION**
Welding Division
4514 West National Avenue, Milwaukee 46, Wisconsin

Attention: W. R. Stephens, Sales Manager

Please send me your free load-capacity table covering the P&H Positioner line.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

2090

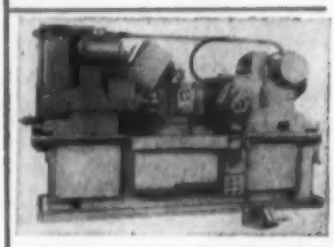
the P&H *Line*

TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PREFAB STEEL HOMES · HOISTS · OIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

Single set-up covering
ALL finishing operations...

MEANS GREATER ACCURACY *with* **GOSS DeLEEUW**



AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

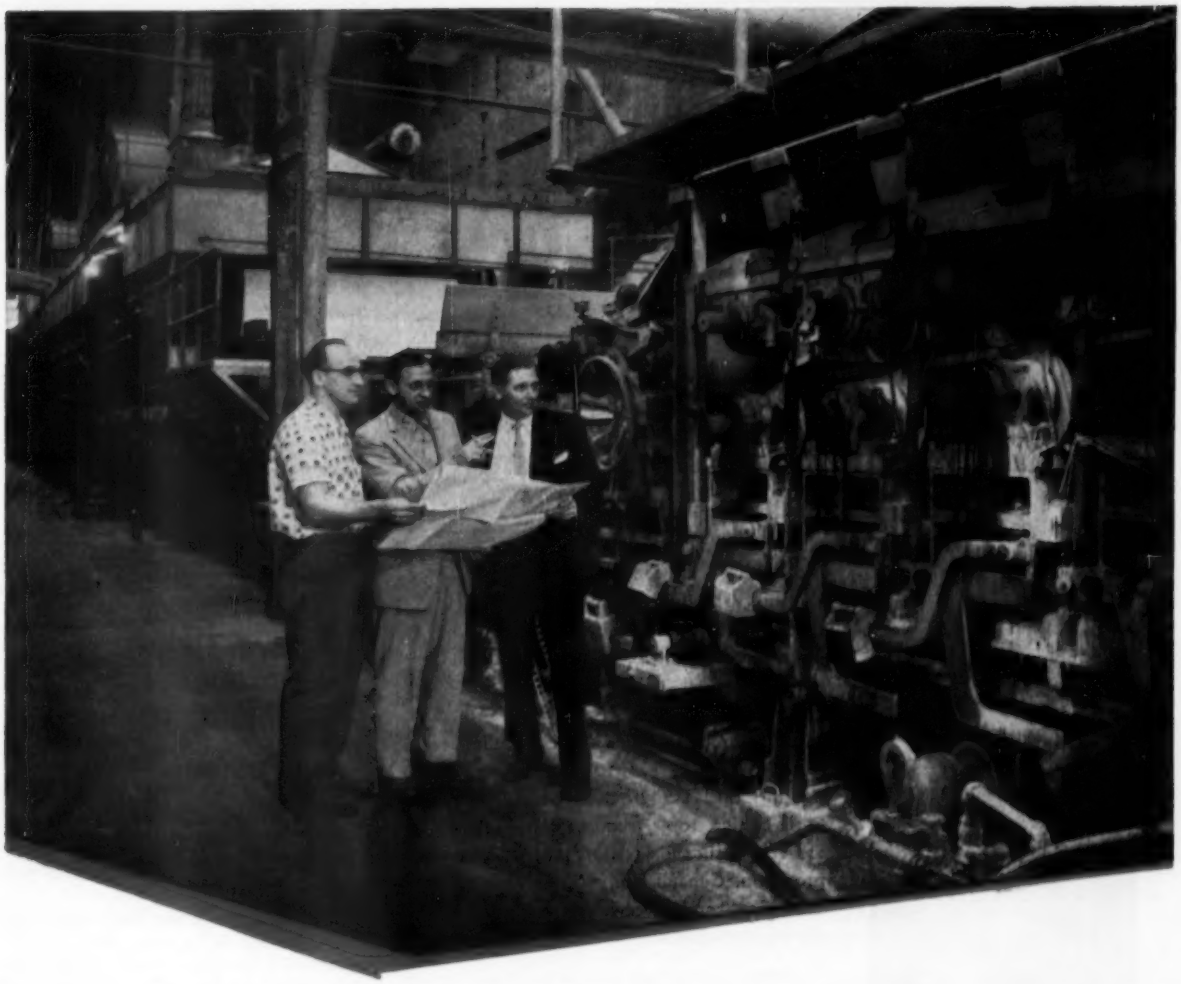
GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ment. If Ed's employers have it in their conditions of employment that there should be two weeks' notice of leaving on either side, Hudson was in the wrong to dodge the issue. Strikes have resulted here in Britain because the customary one week's notice was not given on dismissal, but that does not deter some of the men belonging to the contracting union from trying to evade the "notice" clause, in the event of a better job turning up, which job must be filled immediately.

Ed asserts that Harrison makes a point of giving two weeks' notice before discharge, but we are not told if that is a company agreement with the unions or merely Harrison's own idea of how the men should be treated. I am all for reasonable notice on either side which, if observed by employer and employed alike, works very well, more especially in shops where payment by results operates. In shops where men are employed on time work and are paid by the hour, it does not work so smoothly in all cases. A man on, say, two weeks' notice, paid by the hour, has not much incentive to race the clock especially if he happens to have no other job in view, although some, with an eye on the future, don't slacken off because they are on notice.

They, by giving a fair day's work, hope they are staking their claim for a job with the company when better times come along again. It is my experience that they rarely are disappointed. The here-today-and-away-tomorrow type are less scrupulous and, in their case, the company will probably get one week's work for two weeks' pay. That is one objection

"I'd like a word with you, Binks. This is the third congratulations telegram this week you've gotten from our scrap buyer!"



how Bearings, Inc. goes to work for ...a boxboard plant

Here's service with a capital "S" as we see and practice it at Bearings, Inc.! In the photograph are: left, B. H. Weideman, Millwright Foreman; J. A. Rupp, Maintenance Superintendent of the Ohio Boxboard Company plant at Rittman, Ohio, and the Bearings, Inc. salesman, Jack Houser.

They are going over the final phases of a "bearing survey" Jack has been making for the company over the past six months. In this "survey" every bearing in every machine and pump in the Mill Division was located. The make, type, size and fit of over 4,000 antifriction bearings was determined.

The result of the "survey" has been very gratifying to plant executives. Information on every bearing is now at hand, instantly. Inventories of bearings are being steadily reduced and when the records show, to cite only one example, that 6 large, expensive bearings on 3 mills were identical except for a slight and unnecessary variation in internal fit, then no longer do they stock 4 replacements, 2 are plenty!

Do you need this kind of Bearings, Inc. service in your plant? We'll soon tell you . . . all you have to do is ask, no obligation of course.

Rendering bearing service in the territories adjacent to our branches, listed below.

BEARINGS, INC.

OHIO: • Canton • • Columbus • Dayton • Elyria • Hamilton • Lima • • Youngstown • Zanesville

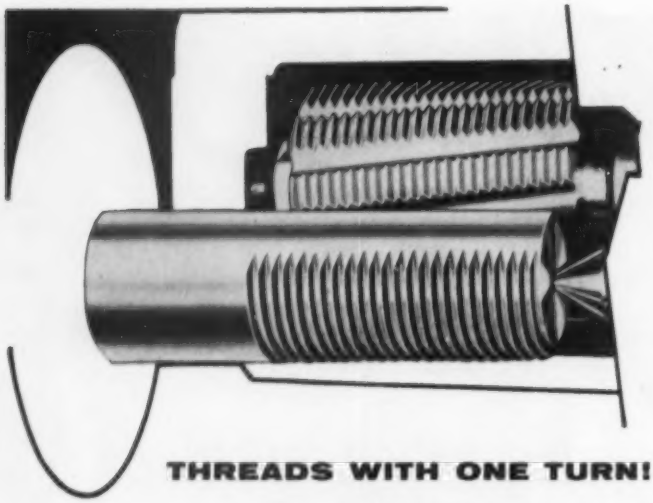
INDIANA: Ft. Wayne • • Muncie • Terre Haute

PENNSYLVANIA: Erie • • Philadelphia • Pittsburgh • York

WEST VIRGINIA: Charleston • Huntington • Wheeling

NEW JERSEY: Camden

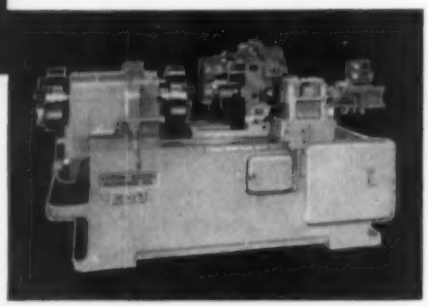
Subsidiaries: Balanrol Corp. • Baltimore, Md. • Buffalo, N.Y. • Kentucky Ball and Roller Bearing Co. • Louisville, Ky.



THREADS WITH ONE TURN!

Hanson-Whitney Thread Milling Machines* produce threads with approximately one revolution of the work. Unusual versatility . . . cutting internal, external, straight or taper, left or right hand threads. An exclusive cam design eliminates back lash . . . provides complete automatic cycle for lead, depth, rapid retraction for gaging or loading. Hanson-Whitney **single source** engineering and manufacture of machine tool, cutting tools, fixtures and gages for screw threads, assures production precision. Consult Hanson-Whitney engineering service, always available in the field or at home offices.

*Available — larger sizes and/or special cycles; automatic loading — rough and finish cycle; extra length beds, oversize swings.



Standard models available in
4" x 9" (hydraulic)
8" x 16"
10" x 24"
15" x 30"

Write for further information and literature

Hanson-Whitney
COMPANY
DIVISION OF THE WHITNEY CHAIN COMPANY
170 BARTHOLOMEW AVENUE • HARTFORD 2, CONN.
TAPS • THREAD GAGES • HOBS • CENTERING MACHINES • THREAD MILLING MACHINES AND CUTTERS

to giving notice of dismissal. Another is the case of a man wanting to leave without giving notice. If the company has a rule of two weeks' notice and insists on it being observed, the disappointed man is not likely to work those two weeks with enthusiasm and the company suffers some loss.

None the less I think a condition of employment should be one or two weeks' notice of leaving, binding on both parties. At the same time, if a man has a good reason for asking that the notice time be waived, I never hold him to his bargain. I authorize his immediate release on two grounds: (1) I never like to bar a man from bettering his position in life, (2) I always regard an unwilling worker as a liability. Better an empty house than a bad tenant who would be going in two weeks' time in any case.

In Hudson's case, I'd let him go on the grounds of being a possible liability were he held. I would not be concerned about his future because of the disagreeable manner of his going. There is a vast difference between asking to be relieved from a contract and presenting the company with a fait accompli, as Hudson did. I cannot imagine a man of Hudson's mentality putting his back into his job if Harrison insisted on him working two weeks' notice. Still, I think Ed made a tactical blunder in firing him.

Ed would seem to have taken a keen interest in Hudson and to have done much for him; gratitude doesn't seem to be Hudson's strong suit. Ed should have treated him with gentle scorn. By sacking him, Ed put himself at a disadvantage. Much better to have simply written out a chit

"Aw, Pop, cut out the ambition, perseverance, hard-work lectures—automation will free one of all drudgery—all I'll have to do is loll around thinking."

for his money, wished him luck, showed no interest in his move and expressed neither regret nor disappointment at his going. Ed would thus serve notice on Hudson that the plant could reasonably be expected to function in his absence.

If I know the Hudson type, that treatment would sting, while firing him would have the opposite effect. The Hudsons don't like to feel that their going alters nothing. If Ed wanted to get one back on Hudson, polite indifference would have been his most effective weapon.

Here in Britain, I should say about 80 per cent of workers give the customary one week's notice of leaving when changing their jobs. Labor is hired through government-controlled employment exchanges. Technically, before an employer can take on a fresh hand, the man concerned must present his employment card to the new company. If a man about to move does not give his employer one week's notice of leaving, his employer can notify the employment exchange to that effect and request them to withhold his employment card, without which he cannot be employed elsewhere.

Without his employment card, a man is deemed to be still in employment. If the employer remains obstinate, the man goes idle for one week, at the end of which time he is deemed to have served one week's notice and the employment exchange can then give him his card, on presentation of which any employer can engage him. Few employers, however, take that line, in order not to cause bitterness. That routine has become so much part and parcel of our industrial system that the majority either work the customary notice or ask to go free, pleading extenuating circumstances. Permission is seldom withheld.

C Donald
Lanarkshire, Scotland

THIS WILL CURL YOUR EYELASHES

A Nilson #2 Four-Slide Automatic Wire Forming Machine is being used by Rollash Corporation, Brooklyn, N. Y., to form wire as shown for their eyelash curler . . . complete in one operation. After one year's operation they report savings of—

40% on actual manufacturing costs
15% on improved tooling which eliminates secondary operations.
10% on fewer rejects, full parts control assuring top precision.
. . . elimination of freight charges by making parts on premises, advantage of immediate access to production.

TOTAL SAVINGS . . . OVER 65%

NILSON 4-SLIDES FEATURE

- One-man operation
- Forming of wire or ribbon metal from coil
- One fast, automatic operation straightens, feeds, pierces, blanks, stamps or coins, cuts off, forms
- Critical tolerances up to .002" on any runs
- Fast tool and die changing
- Wide size range—forms wire up to ½" dia. in feeds to 32" max. Ribbon stock up to 3½" wide
- Press sections 5 to 30 ton cap.
- Heavy duty models 50—75 ton cap.

Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogs . . . the first step in increased production.

A.H. NILSON MACHINE COMPANY

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Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

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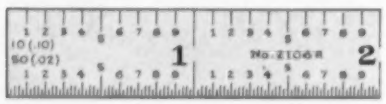
DECIMAL GRADUATED

LONG STEEL TAPES

Genuine leather case, Chrome Clad rust-resistant tape, jet black markings in 25 and 50 foot lengths. Graduated in consecutive inches full length, both upper and lower edges, to 10ths (.10) inch.

STEEL RULES



Machine divided, black filled lines and figures, full range from very flexible to heavy spring tempered with plain or Chrome Clad finish. No. 6 Graduated: 10ths (.10) and 50ths (.02) inches.

TAPE RULES

Rust-resistant Chrome Clad finish, easy-to-read bold black markings, in 6, 8, 10 and 12 foot lengths with heavily plated durable case. Graduated to 10ths (.10) inch throughout length. First 12 inches, lower edge to 50ths (.02) inch.

Chrome Clad finish, a Lufkin exclusive feature on its complete line of decimal graduated measuring devices, provides a harder, more durable, non-glaring finish and increases tool life. It wipes clean and protects against wear, abrasion and rust.

Call YOUR LUFKIN INDUSTRIAL DISTRIBUTOR TODAY! His knowledge of new tools and methods will help you operate at peak production.

"BETTER MEASURE WITH LUFKIN."

THE LUFKIN RULE COMPANY, SAGINAW, MICHIGAN
132-138 Lafayette St., New York City • Barrie, Ontario

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New Books...

CONTAINER SIZE AND PALLET PATTERN SELECTION CRITERIA FOR USE ON 40 x 47-IN. PALLETS—*By J P Akrep and S Stambler, US Naval Research and Development Facility. Published by Office of Technical Services, US Dep't of Commerce, Washington 25, DC. 140 pages. Price $3.00. Order No PB 111845.*

A graphic method for quick selection of patterns for loading 20,000 sizes of containers on the 40 x 48-in. pallet has been devised by the Navy. The chart method assembles data involved in comparative areas, dimensions, and efficiencies, permitting improved area and cube utilization and maximum economy in warehousing and transporting palletized loads. Six master charts present 172 pallet patterns for containers graduated in increments of ⅛ in. from 6 to 52 in. in length, and 5 to 43 in. in width. Individual graphs are plotted for each of the 172 patterns to permit detailed analysis of specific loading problems.

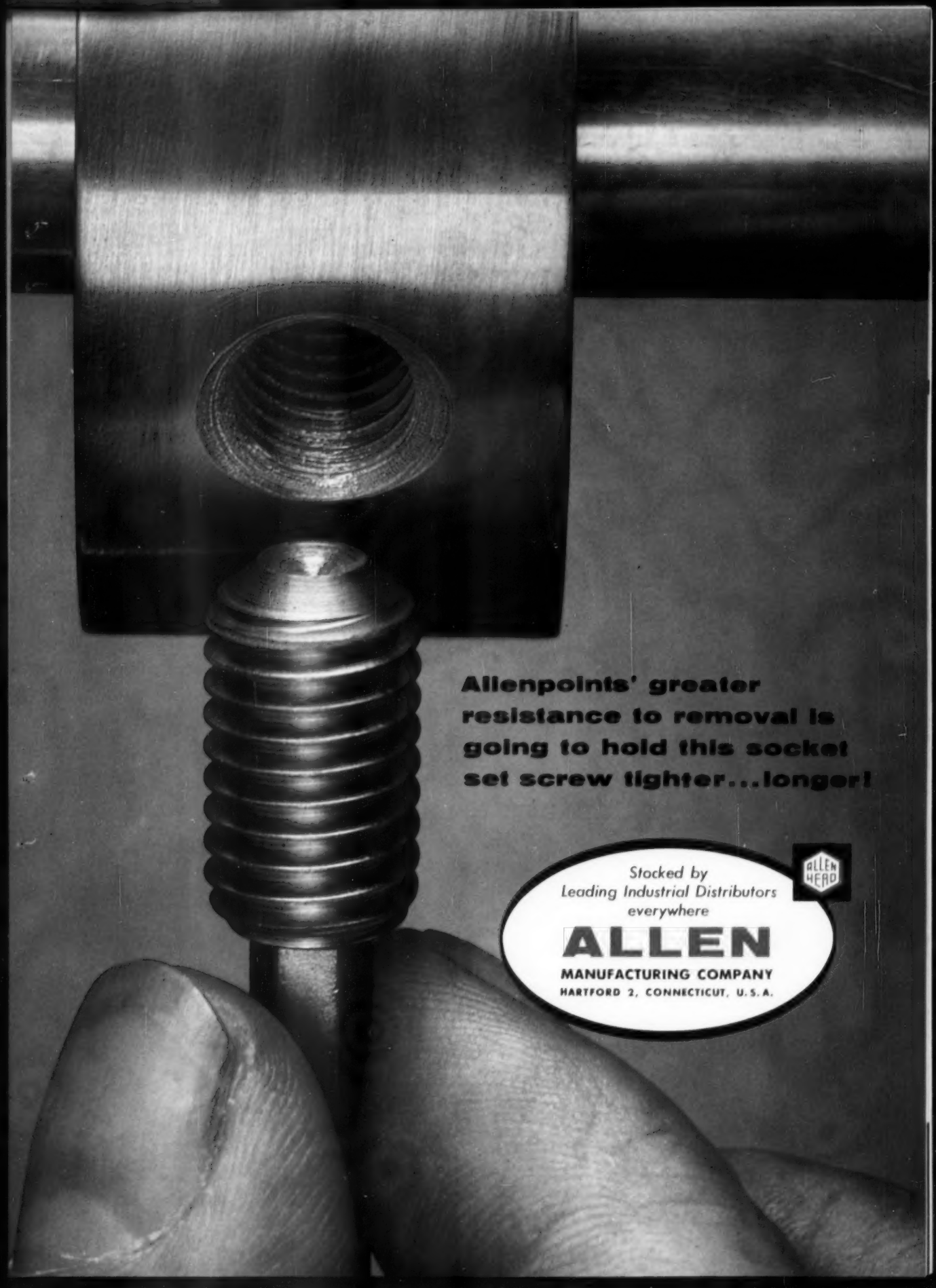
•

SYMPOSIUM ON IMPACT TESTING. *Special Technical Publication No. 176. Published by the American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. 170 6x9-in. pages. Price, $3.50*

Engineers and technologists have shown increasing interest in the effect of impact and shock on various materials. Both on a theoretical and practical basis, investigations have pushed forward new thinking about impact testing not confined to notch bar testing.

This symposium, sponsored by Committee E-1 on Methods of Testing, tries to fulfill the larger needs of this area of testing by including papers discussing impact and shock tests for parts, components and complete structures. Such innovations as the impact tube are discussed, and environmental conditions, particularly temperature, are considered.

Among papers included in the symposium are ones on notched-bar testing, effect of specimen width on notched-bar impact properties of quenched and tempered and normalized steels, and reproducibility of Charpy tests.


Allenpoints' greater resistance to removal is going to hold this socket set screw tighter...longer!
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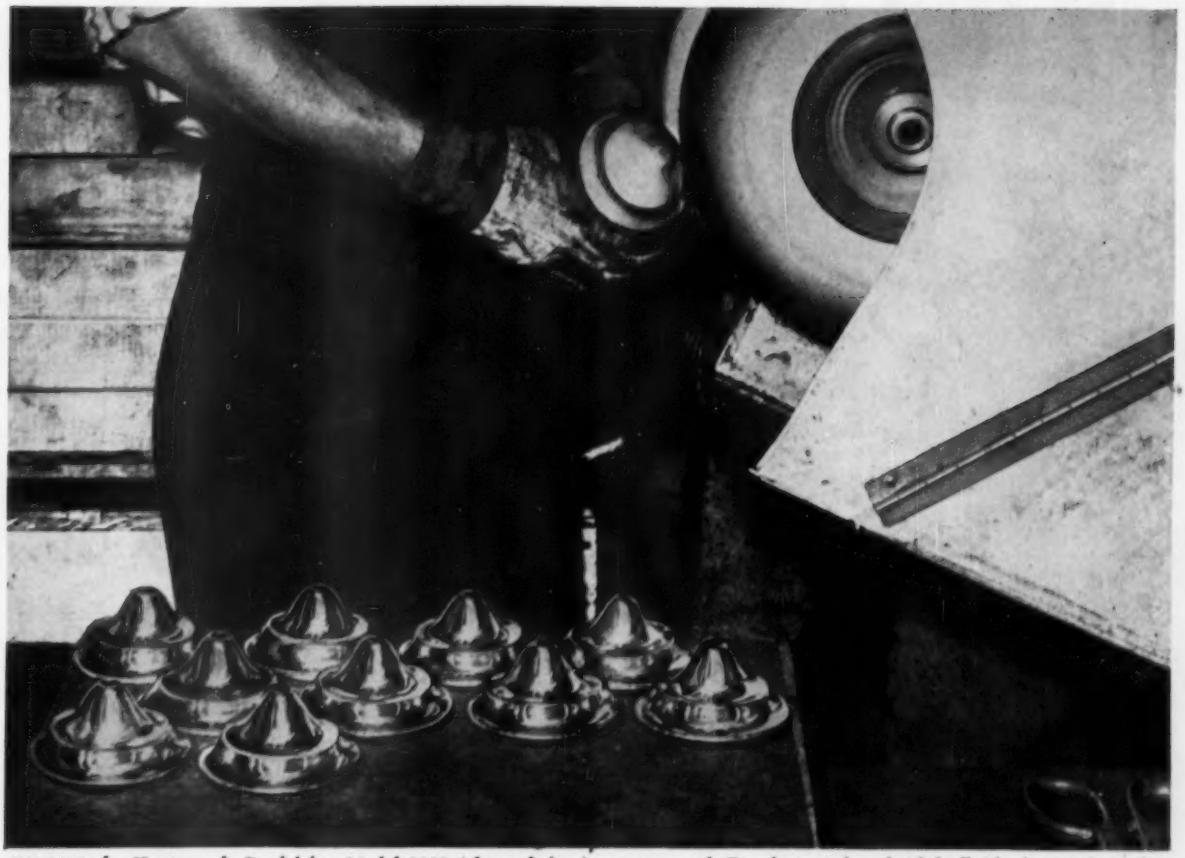


THE BASE of a Huntercraft Candelabra Model 8008 (shown below) requires, with Formbrite, only a finish buff. The base is formed in two drawing operations. The deeper drawn candle cups, also of Formbrite, need only a light cutting with Tripoli and a finish buff.

It's easy to get a jeweler's finish with Formbrite

HUNTERCRAFT Table or Wall Candelabra Model 8008, one of 30 fine brassware items in the line of Huntercraft Originals.

"Formbrite cut polishing cost and time dramatically—was a major factor in keeping our small business alive . . . and growing," says Ralph E. Hunter of Huntercraft.

THE production of Huntercraft Originals—now a nationally distributed line of fine brassware—has grown from a basement hobby to a thriving new business in less than 5 years.

The Hunter Machine Service Company of Racine, Wisc., began manufacturing Huntercraft Originals on a commercial scale in 1951, using ordinary soft forming brass. To get the gleaming jeweler's finish required, polishing time and costs were high. In fact, they were so high that the young company found it impossible to bring their prices into line with competition.

In 1953, they tried Formbrite®, Anaconda's superfine-grain drawing brass. The polishing bottleneck was broken and production soared—unit costs went way down. According to Ralph E. Hunter, owner and president of Hunter Machine Service Co., Formbrite was a major factor in keeping the company alive and enabling it to go on to become a stable, growing business. The finish obtained so easily on Formbrite, he adds, is superior to that achieved on ordinary drawing brass.

Formbrite is a premium product at a nonpremium price. Find out for yourself how its superfine-grain, excellent drawing properties, strength, and scratch-resistance can help you make a better product at lower cost. Write for Publication B-39. Better yet, ask for a sample or a trial batch. Address: The American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 6072

Formbrite SUPERFINE-GRAIN DRAWING BRASS

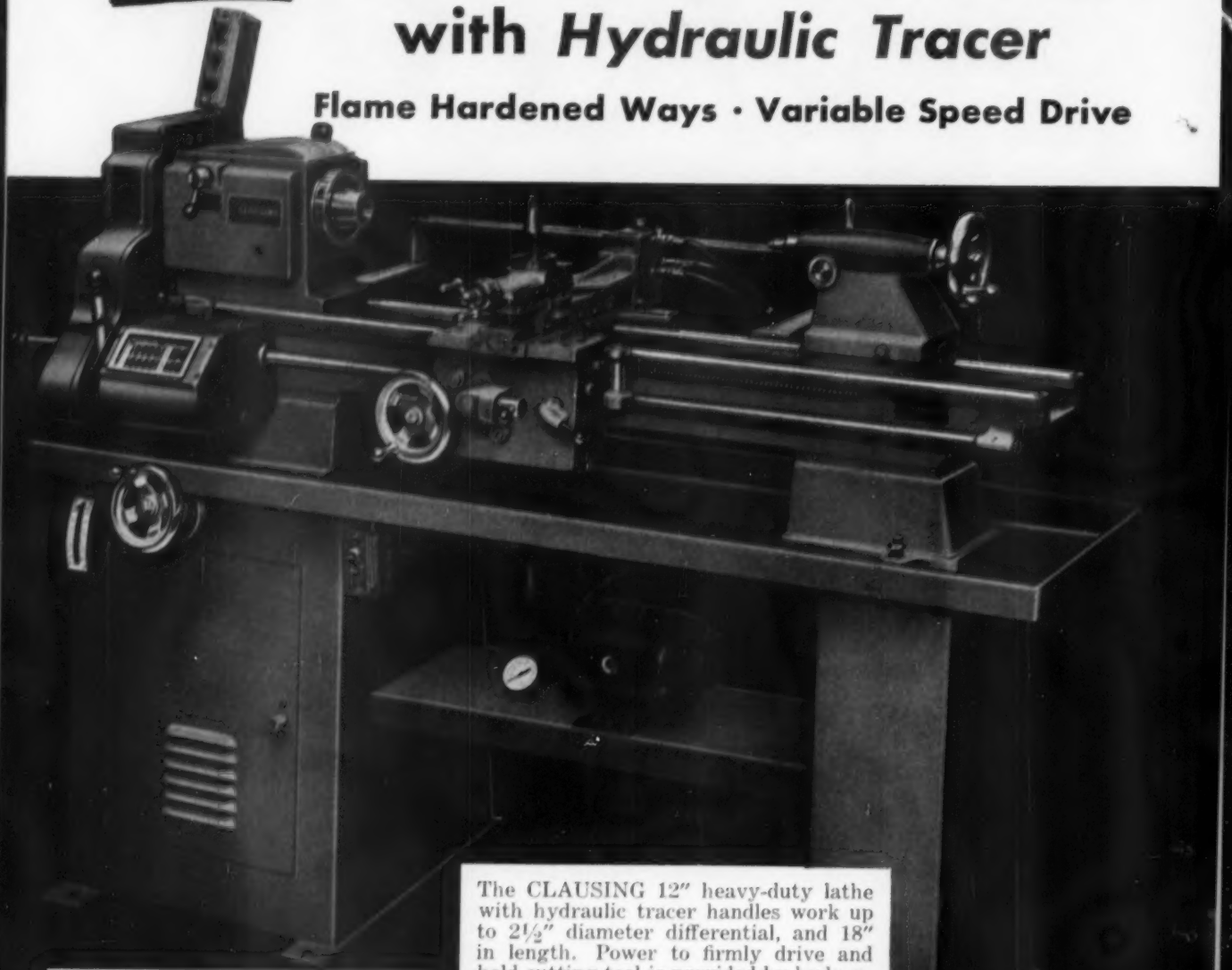
an ANACONDA® product

made by The American Brass Company

NEW CLAUSING 12" LATHE

with *Hydraulic Tracer*

Flame Hardened Ways · Variable Speed Drive



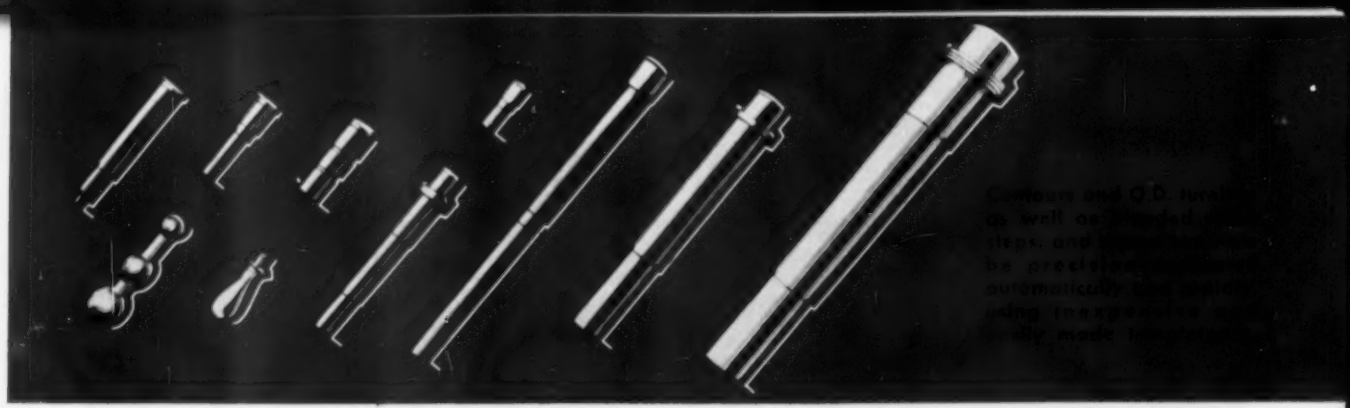
The CLAUSING 12" heavy-duty lathe with hydraulic tracer handles work up to 2½" diameter differential, and 18" in length. Power to firmly drive and hold cutting tool is provided by hydraulic cylinder housed in Servo motor mounted on lathe cross slide. Servo motor is integral for quick response . . . instantaneous as pressure at stylus changes. Slide feed, in and out, is infinitely variable from 0 to 15" per minute and is controlled by knob on top of Servo. All critical parts of tracer unit hardened, ground and machine lapped. No packings or gaskets. Unit completely sealed against dust and dirt. Motor, pump, reservoir and pressure gauge are an integral unit, and located on shelf under lathe chip pan.

No. 6390
CLAUSING 12" lathe with hydraulic tracer, complete as shown, ready to run — ONLY $2325.00 F.O.B. Factory
See Specifications (opposite page)

Atlas PRECISION MACHINE TOOLS — CLAUSING — DIVISION ATLAS PRESS COMPANY KALAMAZOO, MICHIGAN U.S.A.

THE PLUS VALUE LINE

LATHES • DRILL PRESSES • VERTICAL MILLING MACHINES



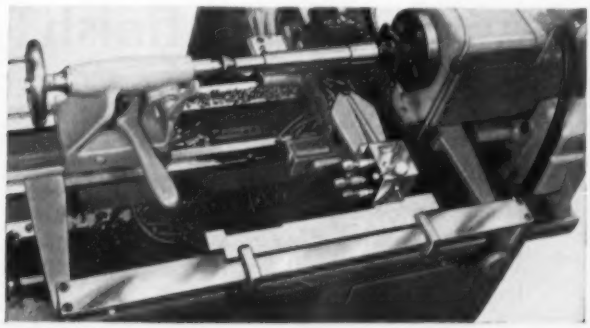
Precision duplicating of multiple diameters, tapers, bevels, shoulders, radii, grooves chamfers

With this new CLAUSING 12" LATHE with HYDRAULIC TRACER you can . . .

- do automatic between-center reproduction of intricate patterns, reducing to minutes or hours jobs that would otherwise require days or weeks.
- eliminate repetitive measurements, multiple tool setups, and expensive forming tools.
- impart a smooth, stepless finish because of the continuous, single-tool cut. Frequently eliminates the need for grinding or polishing.
- make a complete set-up change in less than 10 minutes; tool change in less than 1 minute.
- provide automatic sizing; reduce chance for human error; practically eliminate scrap.

FOR SHORT RUN AS WELL AS VOLUME PRODUCTION

— because complete set-up and tool changes can be made in minutes, short runs can be done economically — the savings on long runs are phenomenal. Lathe can also be used without tracer. Takes just a few minutes to remove tracer and replace cross slide screw.



CONDENSED SPECIFICATIONS—TRACER LATHE

Bed ways flame hardened — V-ways, flat ways and sides precision ground. All 6 surfaces align to within .001".

Variable speed drive — 43 to 222 and 250 to 1300 RPM. Adjustable to correct speed without stopping lathe or shifting belts.

Lathe — Swing over bed 12¾", 33½" between centers, 59" bed.

Headstock completely enclosed and all moving parts run in pumped bath of oil.

Spindle is forged precision ground steel with 1⅜" bore and 1" collet capacity. No. 3 MT bore. Hardened and ground nose is ASA—L-00 tapered key-locked type. Spindle turns on big Timken "Zero Precision" tapered roller bearings.

Enclosed quick-change mechanism — gears and shafts run in bath of oil. Instant selection of threads or feeds — 54 feed from .00065" to .36" per R.O.S. — right and left hand threads from 4 to 224 (including 27 per inch).

Tracer Unit. Cross travel 1½" (2½" diameter differential). Longitudinal capacity, 18". Cross feed, infinitely variable from 0 to 15" per minute. Motor, 110 V, single phase.

No. 6390 12" CLAUSING Lathe, with flame hardened ways, variable speed drive powered by 1½ HP, 3 phase motor, reversing switch, hydraulic tracer complete with single phase motor. $2325.00 FOB factory.

WRITE FOR ILLUSTRATED LITERATURE!

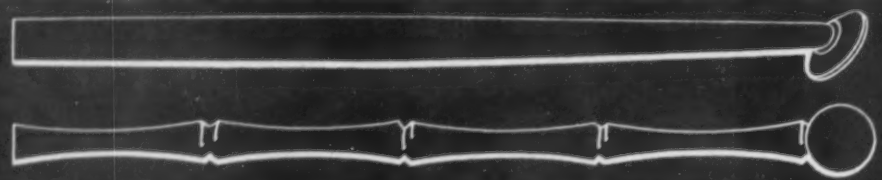
CLAUSING

DIVISION

Atlas Press Company

11-101 N. Pitcher St., Kalamazoo 7, Mich.

Matching metal to job with Bridgeport alloys



These intricate bamboo-design table legs are machined from Bridgeport Alloy #6 Free-cutting Brass Rod.
Table rim is formed into circle, then soldered. For this part, Bridgeport supplies Yellow Brass strip in a soft temper for bending.
Tables made by I. W. Arm Works, New York, for Jeral Brass Products, New York, N.Y.

For machined parts with a furniture finish...
Bridgeport HIGH I. Q.* rod

When finish is a factor – as in these unusual machining jobs – it's important that you choose the alloy with exactly the *right* combination of physical properties. Bridgeport's wide range of quality alloys and technical experience in practical production problems make it easy to match the right metal to your product or design. For brass, copper or aluminum, call or write your Bridgeport Sales Office today. They'll also be glad to arrange for Bridgeport Technical Service on your metals and methods.

**High Inner Quality*

BRIDGEPORT BRASS

Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Connecticut • In Canada: Noranda Copper and Brass Limited, Montreal

NEW

No. 3-36 . . . 36" table travel . . . 64" x 16" table . . . full automatic hydraulic feed.

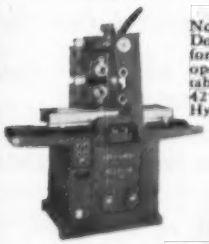
No. 3-36
HYDRAULIC MILLING MACHINE

Now—the family of Kent-Owens Milling Machines has expanded to give you the same unexcelled milling accuracy, speed and dependability for *larger size work!*

Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

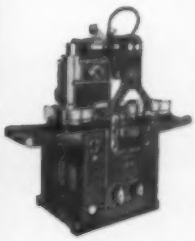
Kent-Owens Machine Co., Toledo, O.

Simple . . . Rugged . . . Efficient



No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.

No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

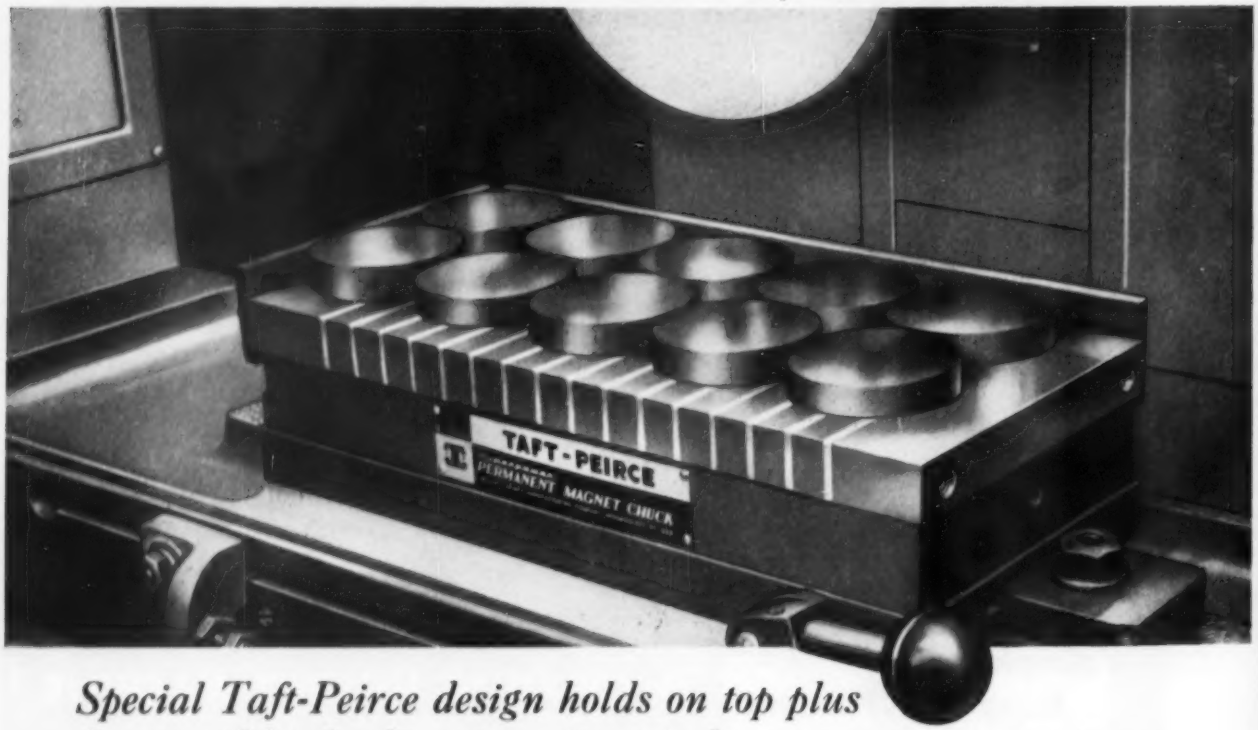
No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 12" table travel . . . head counter-balance is adjustable.

Call on

KENT-OWENS
for MILLING MACHINES

KENT-OWENS REPRESENTATIVES

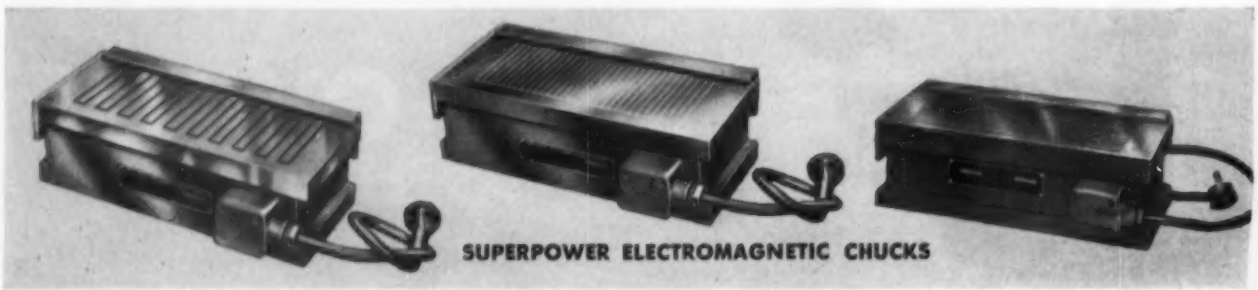
The Only Permanent Magnet Chuck



Special Taft-Peirce design holds on top plus front and back edges, permits grinding more pieces per pass

Never before have permanent magnet chucks been able to handle so many jobs! This new versatility comes from a combination of four very important design features found only in Taft-Peirce Superpower Permanent Magnet Chucks.

- Low height — increased clearance between wheel and chuck gives higher work capacity.
- Releases quickly in "Off" position — minimum of residual magnetism.
- More magnetic poles for its size — uniform pole spacing allows firm holding of smaller parts.
- Poles extend full width of face plate, no waste space or dead spots — increases capacity and simplifies setups.

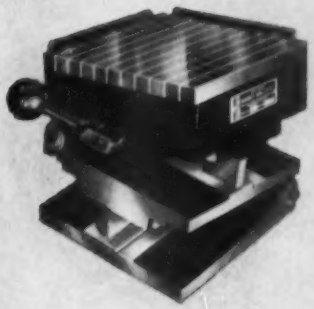


Taft-Peirce offers a wide selection of electromagnetic rectangular chucks. Key features: Extra heavy concentration of magnetic flux, greater magnetic work area, all-steel, one piece construction, sealed electrical components. Result: Maximum use of energy, more even distribution of magnetic flux. There are seventy-five standard sizes, plus a very extensive line of special patterns.

Plain Face Plate Chuck (left) is a general-purpose type, used for most chucking applications. Fine Mesh Chuck (center) has closer pole spacing, holds work of very small or thin section. Longitudinal Poles Chuck (right) holds long, narrow work firmly along entire length of piece.

with 100% All-Over Holding Power

ADJUSTABLE CHUCKS



Taft-Peirce modern chuck features are also available in several standard adjustable models designed to save setup time and insure accuracy on angular grinding jobs.

Duplex Model Electromagnetic Chuck (top illustration) is a precision grinding fixture, swivels to 90° on either side of horizontal, tilts to 14°. Clamps rigidly at any setting.

Sine Angle Permanent Magnet Chucks are available in either simple or compound (lower illustration) models. Angles from 0° to 90° are set quickly and surely with standard gage blocks. Electromagnetic models can also be furnished from stock.

Permanent Magnet Chucks are furnished in sizes from 3″ x 6″ to 10″ x 15″. Check into the amazing holding power and see how it can simplify your grinding, planing, and light milling operations. Electromagnetic Chucks range in sizes from 4″ x 8″ to 36″ x 60″. Larger chucks can be assembled from these standard Superpower units.

All types and sizes of standard Taft-Peirce Magnetic Chucks are readily available. Special chucks for unusual holding applications are designed and built on request. Write for catalog on complete line of Superpower Electromagnetic and Permanent Magnet Chucks — then make sure you . . .

Tips

ON USING MAGNETIC CHUCKS

Always position work on chuck to introduce maximum magnetic flux. Flux is dependent upon the total gap length in contact with work. Setup in Fig. 1-A will hold piece firmer than setup in Fig. 1-B

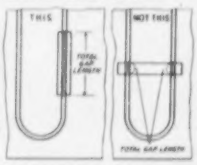
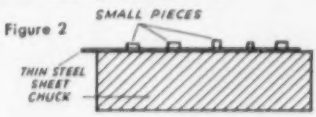


Figure 1-A Figure 1-B

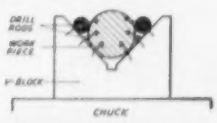
With exceptionally small pieces, place a thin steel sheet upon chuck and the small pieces on top of it, over the gaps, as in Figure 2. Steel sheet will concentrate flux through the pieces.

Figure 2



When holding round work in magnetic V-blocks on a chuck, more flux and holding power can be obtained by using appropriate sizes of drill rod to provide additional points of contact, as shown in Figure 3.

Figure 3



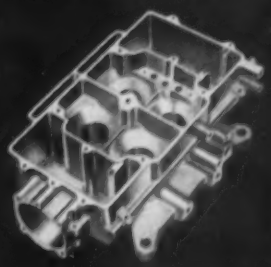
T-P

TAKE IT TO TAFT-PEIRCE

The Taft-Peirce Manufacturing Company
Woonsocket, Rhode Island

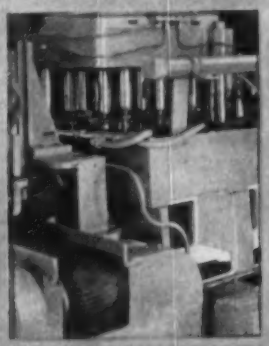
T-P Means TOP Precision

2 BARREL MAIN CARBURETOR BODY



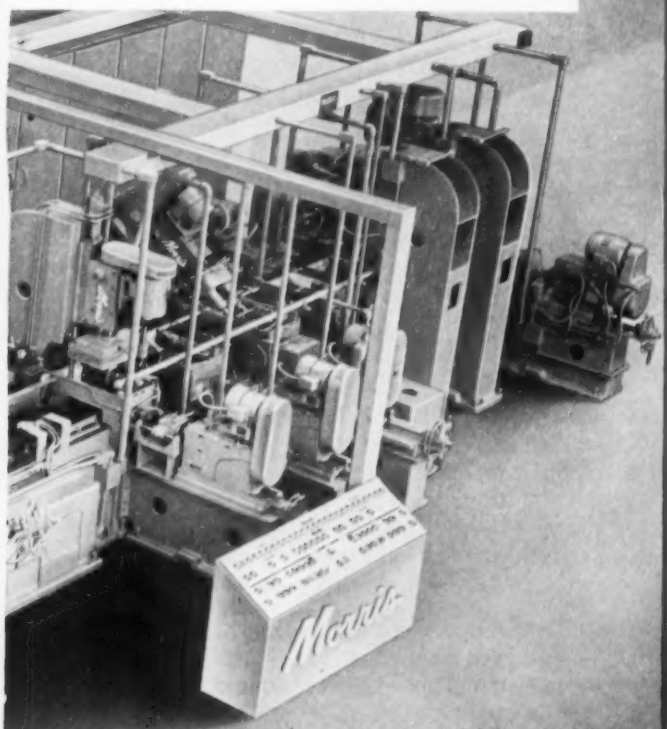
4 BARREL MAIN CARBURETOR BODY

one part completed every



Automatic loading section checks parts, rejects those in improper position. At first station, precision locator holes are drilled and gauged for accuracy.

7½ seconds!



new Morris

IN LINE TRANSFER TYPE

HIGH PRODUCTION MACHINE

480 parts/hour
56 stations
90 operations

31 DRILLING
19 BORING
10 REAMING
4 GAUGING
13 PROBING
13 TAPPING

Fast . . . flexible . . . high-speed production of 2- and 4-barrel carburetor bodies is completely automatic on this new MORRIS machine, designed for a major automotive manufacturer.

MORRIS designs, engineers and manufactures high production machines, using basic units and automatic drilling units . . . to provide a "special" machine at a fraction of the usual "special machine" price.

Write, outlining your production problem, or send samples of your parts for analysis by MORRIS engineers.

THE MORRIS MACHINE TOOL CO.
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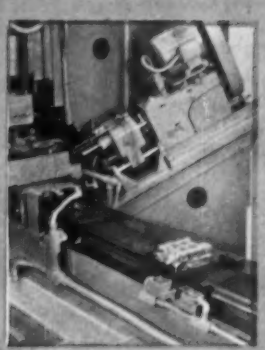
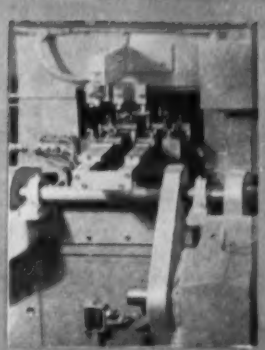


First and second sections may be operated individually or as a single unit. This center section provides automatic unloading and loading as required. Automatic storage may be provided.



Automatic delivery of parts to unloading conveyor (not shown) after machining. Note precision locating pins in fixtures.

Duplication

Duplication

KOPY-KAT Duplication

is a direct hydraulic transfer with no intermediate motions

machining is completely automatic

there is no chance for irregularities or error in final work

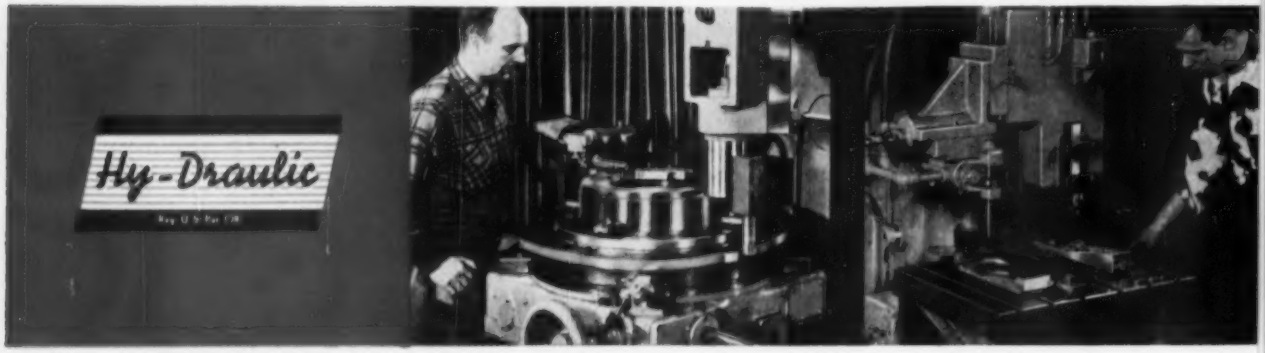
The KOPY-KAT is adaptable to an endless variety of duplicating jobs, from the simplest to the most complex. Manufactured specifically by Rockford Machine Tool Co. for use on new machines, it becomes an integral operating part of any hydraulic shaper, planer or slotter on which it is installed.

Investigate the KOPY-KAT which duplicates automatically with the ease of straight-production machining . . . and faithfully reproduces many forms previously considered impossible to machine.

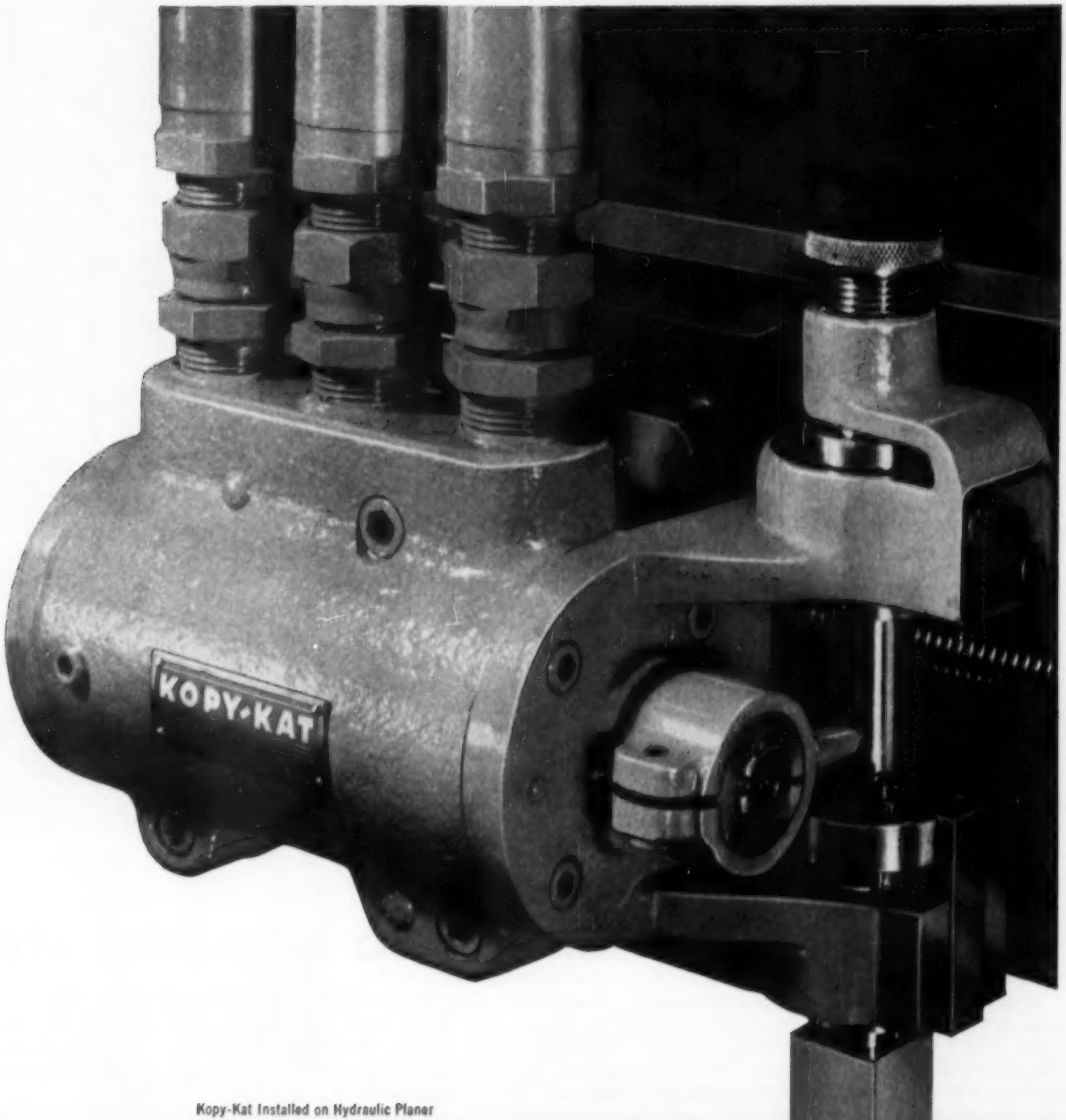
Ask a Rockford Machine Tool Co. representative for further information . . . or write directly to us.

Kopy-Kat Installed on Hydraulic Slotter

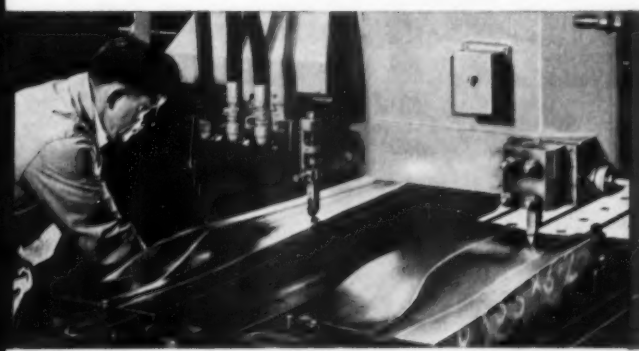
Kopy-Kat Installed on Hydraulic Ram Shaper



SHAPERS • PLANERS • SLOTTERS • SHAPER-PLANERS • LATHES

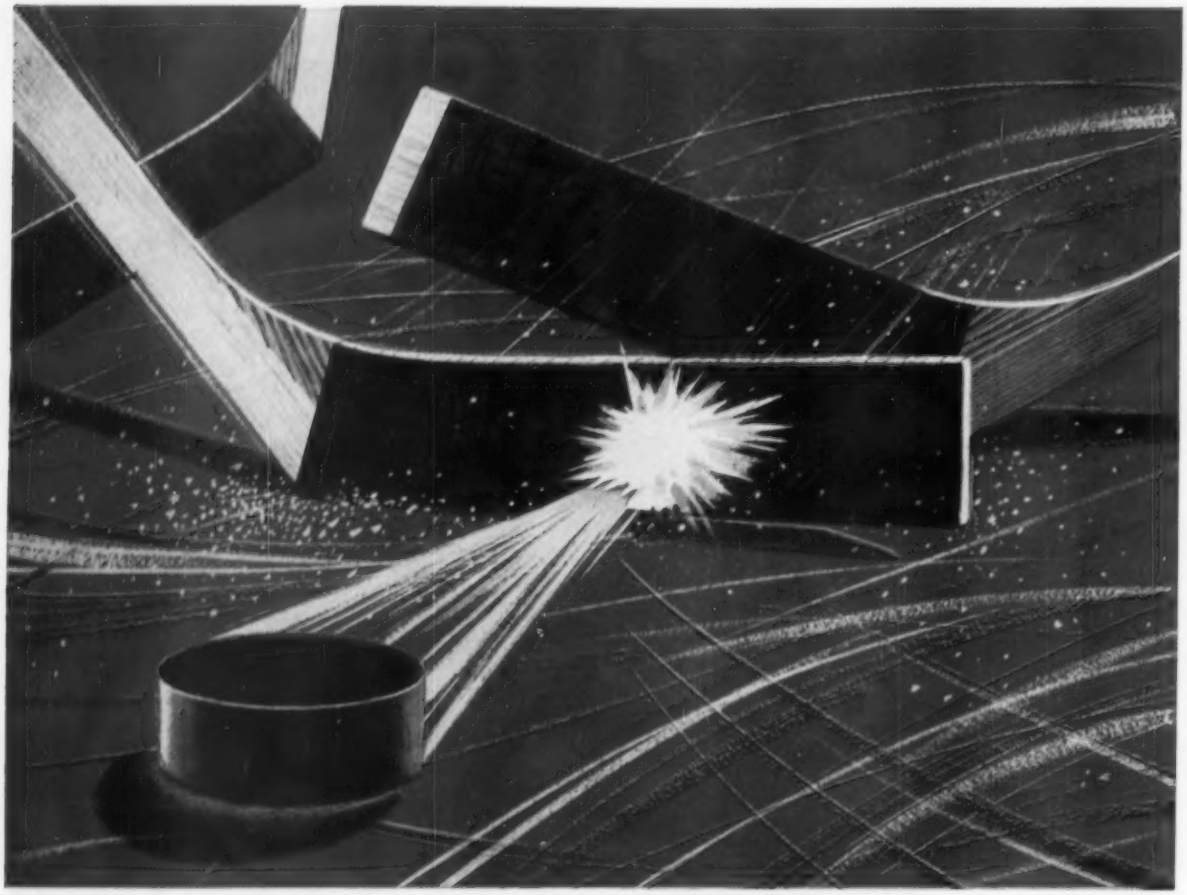


Kopy-Kat Installed on Hydraulic Planer



A new motion picture film "The Rockford Kopy-Kat" is available through your local distributor.

ROCKFORD MACHINE TOOL CO. ROCKFORD, ILLINOIS



"Finish first in your league"
...with J&L 1200 COLD FINISHED STEELS

When your machining applications require a steel that's tops in quality, machinability, uniformity and surface finish—"J&L 1200" Cold Finished Steel is the answer. It's one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your problems.

Operators in shop after shop around the country using "J&L 1200" report:

- **Better machine finishes**
- **Improved tool life**
- **Increased machining speeds**
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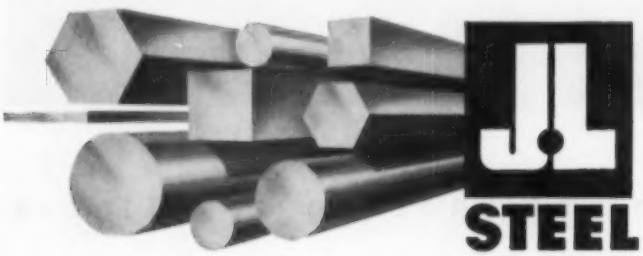
"J&L 1200" grades, available in all standard shapes and sizes, meet the compositions published by the American Iron & Steel Institute (AISI C-1213) . . . Society of Automotive Engineers (SAE 1113) . . . and Federal Specification QQS-633.

Use this steel in your own shop to secure better work at lower over-all costs. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor today for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



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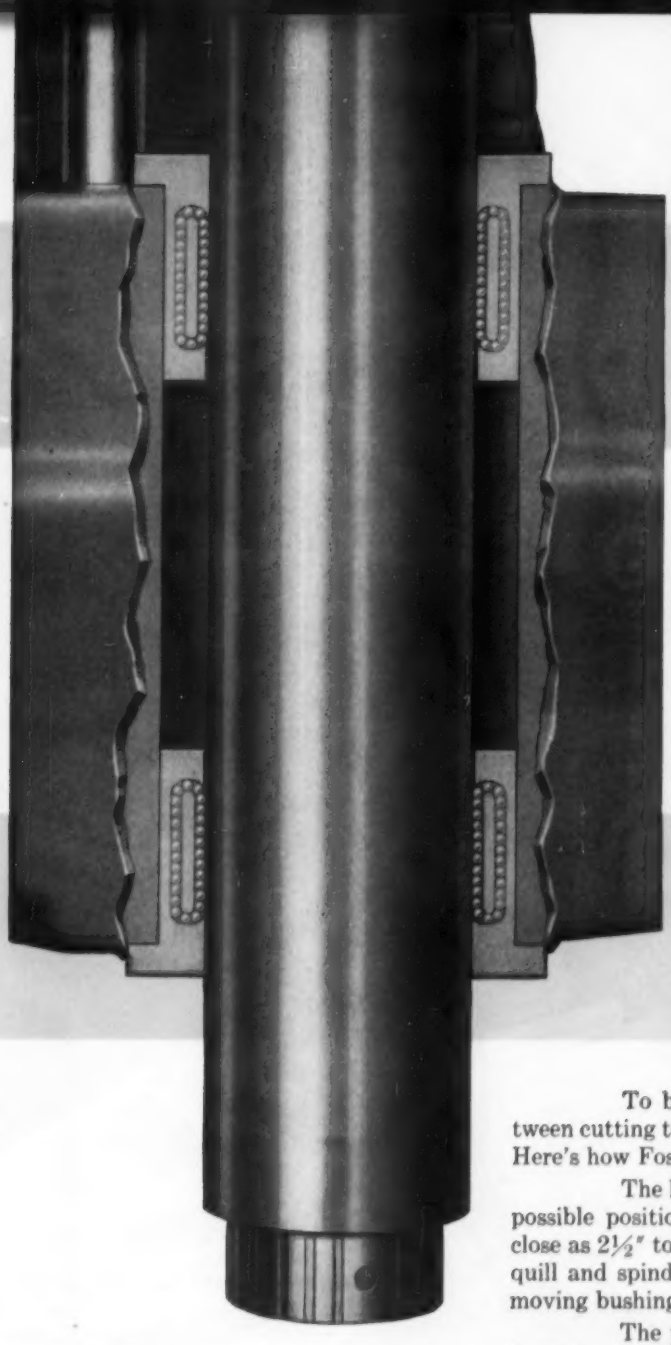
COLD FINISHING PLANTS AT PITTSBURGH, PA., AND HAMMOND, IND.



NEW QUILL BEARING DESIGN helps achieve extreme precision in Fosmatic Jig Borer

Eight models available from the low-cost Model 30 with 36" x 18" table, to the virtually automatic model 54P with 54" x 22" table. Other important features: Automatic Positioning, choice of two precision measuring systems, milling feed, rapid traverse to quill, power clamping of table and saddle, coolant system and reversing motor control for tapping.

To bore with precision as close as ±.0001", distance between cutting tool and lower quill bearing must be held to a minimum. Here's how Fosdick minimizes this crucial distance.

The lower quill bearing is *permanently* located at the lowest possible position in the head, permits boring with spindle nose as close as 2½" to the bearing. Bearing does not ride up and down with quill and spindle as in conventional designs where balls are held in moving bushings.

The permanent location of quill bearings is made possible by unique Fosdick design—vertical ball races with preloaded precision balls circulating continuously. This design also permits spindle and quill to be shorter; thus stronger and more rigid. Both are perfect cylinders with no cuts on the outside.

Engineering advancements like this make the Fosmatic Jig Borer the most rigid and precise boring machine you can buy. Write today for the new catalog.

NEED JIG BORING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

McKay's *Flex-Roll Processor*

Conditions steel prior to fabricating to eliminate stretcher strain, minimize tearing

THE NATION'S foremost metal fabricators, including all the leading automotive manufacturers, have proved the McKay Flex-Roll Processor to be the finest equipment of its kind available to industry today.

If you are doing any amount of deep drawing, you cannot afford to be without the services of this amazing unit. Let our sales engineers put you in contact with a user in your area . . . a few minutes of your time will convince you of its value. ***The McKay Machine Company, Youngstown, Ohio.***

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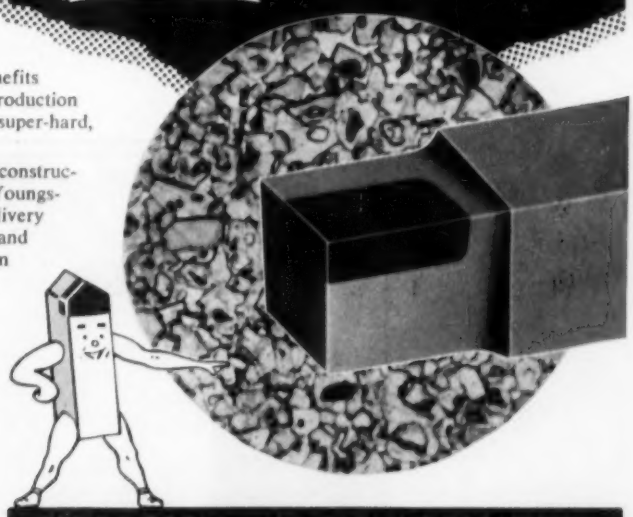
All Tools May Look Alike—But it's What's INSIDE That Counts

● An extensive, 2-year research program has produced a new series of Talide Metal grades having greatly improved hardness, strength, rupture-resistant and crater-resistant qualities. Users can now get maximum benefits from today's high-speed "automation" machines. Record production runs and continuous machine performance is assured with super-hard, super-tough Talide Tools.

● Universal acceptance of Talide Metal has made possible construction of a new 100,000 sq. ft. multi-million dollar plant at Youngstown, Ohio. Doubled production facilities assure prompt delivery and fast service. All Talide Metal grades are uniform and consistent in quality. They are processed in latest type vacuum electric furnaces under rigid laboratory control. Every test **proves** Talide is Best!



MULTI-PURPOSE TOOLS

TALIDE TOOLS GIVE TOP PERFORMANCE

40% more forgings cut at Automotive Engine Plant.

Part	C-1141 steel forging 1-1/2" dia. x 14" long.
Operation	Turning multiple diameters.
Machine	New Britain Chucking Lathe.
Tool	Talide triangular insert #TB-12123, Grade S-88 (Industry Code C-5), mounted in Klamp-Lok Toolholder.
Depth of Cut	1/8" to 3/32" R.P.M. 1540
S.F.P.M.	580 Lubrication None
Results	71 forgings machined per edge per grind compared to 49 machined with best competitive premium grades.

Double Production obtained at Electric Motor Plant.

Part	1040 steel pump shaft, Brinell 186.
Operation	Turning 3 diameters and 1 taper.
Machine	Sundstrand Automatic Lathe.
Tool	Talide triangular "Throw-Away" insert, 3/8" I.C. x 1/8" thick, Grade S-92, mounted in Klamp-Lok Toolholder.
Depth of Cut	3/8" Feed .021" S.F.P.M. 300
Results	31 shafts machined per edge per grind. Best competitive premium grade produced only 16 before fracturing. Exceptional toughness of Talide grade evidenced by only slight mushrooming of edge—no fracturing.

Call in a Talide sales engineer to recommend proper tooling for your machining operations, or write for 84-page catalog No. 56-G. ***METAL CARBIDES CORPORATION,*** *6001 Southern Blvd., Youngstown 12, Ohio.*

SEND FOR SPEED & FEED CHART—Pocket-size plastic chart gives complete information on speeds, feeds, relief angles and recommended grades for cutting all metals.

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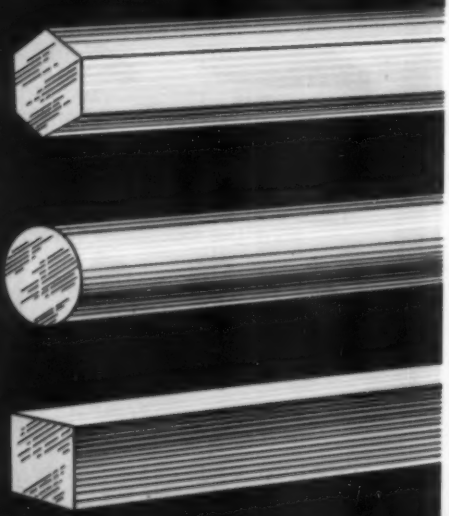
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

GOOD AND STRAIGHT—*won't whip!*

CHASE® free-cutting BRASS

ROD • BAR • SHAPES

Screw machines really purr along when you feed them Chase Free-Cutting Brass rod! Uniform lengths and straight lengths that won't whip, superior machinability, longer runs before regrinding tools, all mean more pieces per length, fewer rejects and less down time per machine. Order from your Chase warehouse!



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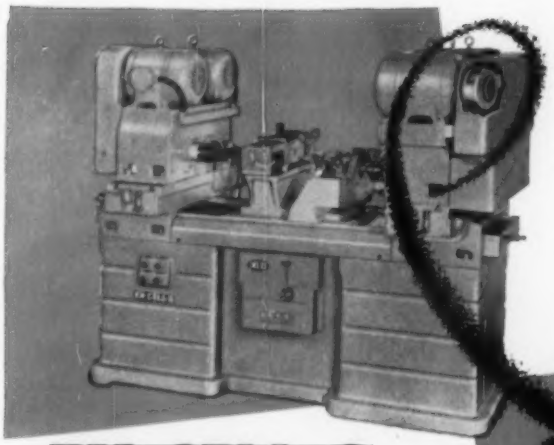
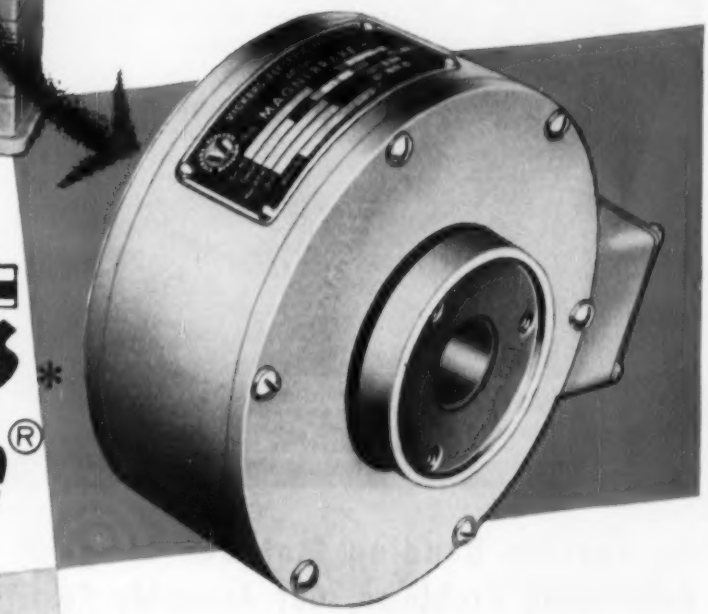


FOR SMOOTHER QUIETER and MORE DEPENDABLE PRECISION BORING MACHINE OPERATION



EX·CELL·O uses the VICKERS* Magnebrake®

DRY MAGNETIC-PARTICLE BRAKE

Ex-Cell-O Corporation of Detroit, well-known manufacturer of quality machine tools, equips its precision boring machines with Vickers MAGNEBRAKE, because this unique braking equipment provides the important advantages of . . .

- **LONGER, TROUBLE FREE LIFE,** requiring much less brake maintenance than ordinary friction-type braking systems . . . thereby minimizing and in some instances, eliminating machine down-time. There are no shoes or linings in Vickers MAGNEBRAKES — nothing to wear out — your assurance of far longer, trouble free service life.
- **SMOOTHER, FASTER, QUIETER PERFORMANCE,** without troublesome grab or chatter. Since torque is independent of speed in the MAGNEBRAKE, stops are far smoother . . . thereby preventing transmission of brake vibrations through the spindle and to the work.

Vickers MAGNEBRAKES can serve you with the efficiency, dependability and durability needed for today's faster working duty cycles, higher operating speeds and higher inertia loads. Vickers engineers are thoroughly experienced in the application of industrial clutches and brakes. They will be happy to examine your problem and to offer competent engineering advice, without obligation. Write today for more detailed information.

*TRADEMARK

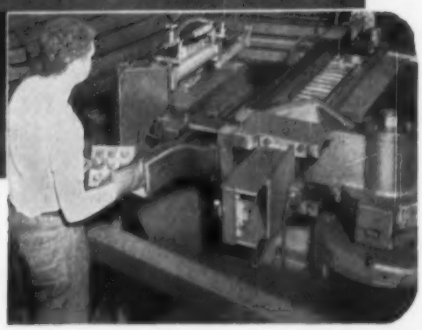
VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1879 LOCUST STREET • SAINT LOUIS 3, MISSOURI

Now-COLD BENDING THE "PINES-WAY" PRODUCES MORE ACCURATE AUTOMOBILE FRAMES

View of Pines Production Bender, one of 28 in large plant, forming 5th bend in frame side rail. Tube is 4"x4½"x.090 formed to a 38° angle on a 17½" I.R.



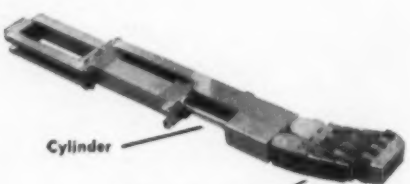
▲ Close-up view of machine used to produce 4th bend in long side rail member. Five different bends are made in this piece, each in sequence on separate machines. Accuracy is held within .030" to .045" at seven check points. Spring-back is easily controlled by simple stop settings — an important factor that cuts tool costs.

Production Bending Methods Simplify Fabricating Problems, Cut Assembly Costs

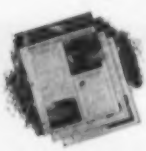
● The unusual versatility of PINES Bending Machine methods is again demonstrated by the successful production line application shown above in a large plant manufacturing automobile frames. Proven by more than eighteen months of operation, a battery of twenty-eight special PINES Benders are now forming tapered welded steel tube frame members at a rate of 120 bends per hour. These machines with their ingenious tooling — designed, developed, and built by PINES — form seven bends in each side rail member and produce more accurate parts than ever before possible. The end result is a stronger, more accurate chassis that greatly reduces body assembly problems.

Typifies Progress in Cold Bending Techniques

This revolutionary new manufacturing method is the result of long months of cooperative efforts between Pines and automotive engineers. It is typical of the consistant progress being made in profitable application of cold bending in the manufacture of a wide variety of metal products. It may also pay you to investigate the design possibilities and the production advantages of cold bending the "Pines-way." At your first opportunity call in our Sales Engineers for free survey.



▲ View of a flexible articulate mandrel used for making a bend at a right angle to, and within, a previously bent section. Mandrel is automatically inserted and expanded. Insures smooth, neat bends.



Write FOR MORE DATA

If you would like case study data on production bending, write today for free copies of Pines News.

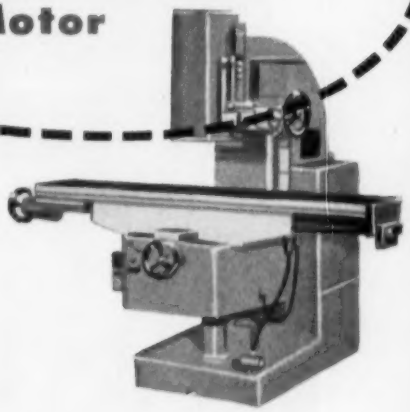
PINES ENGINEERING CO., INC.

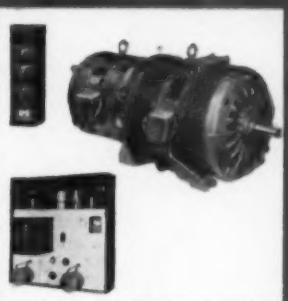
Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

You can speed-up your machine-tool operation *when this button* operates a LOUIS ALLIS Adjustable Speed Drive or Special Motor



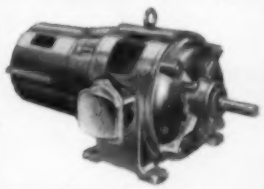


Ajusto-Spede® Drive

puts precision speed control at the operator's fingertips. ¾ to 75 hp. AC. Uses eddy current clutch to provide speed ranges up to 17:1. Tachometer feedback circuit offers precise speed regulation. Optional features available include dynamic braking, torque control, inching, jogging, multimotor operation and range drives.

Select-A-Spede Drive

5 to 200 hp. Magnetic amplifier and adjustable voltage control provides superior speed regulation from ¼ base speed to full speed. Optional control features include reversing, dynamic braking, jogging, special programming or sequencing, extra wide speed range. Electronic and Static Select-A-Spede Drives also available in smaller horsepower ranges. Speed regulation to ½% in ranges up to 100:1. All operate from AC source.



Blower-cooled Motor.

Rolled-shell, Shaftless Motor.

Special Motors

You don't have to compromise — or take a unit that "almost" does your job when you choose Louis Allis. On short notice you can get a unit exactly engineered and designed for your job. Some of the special characteristics built into Louis Allis motors for specialized machine-tool use include high starting torque, high slip, multi-speed operation, and rapid reversing. Other special features may include precision balance, high-frequency operation, and special-duty cycles. For these or any other special electrical or mechanical modification for machine tool work, see Louis Allis first.

Get the precision drive your machine tool requires from the *complete* Louis Allis Line

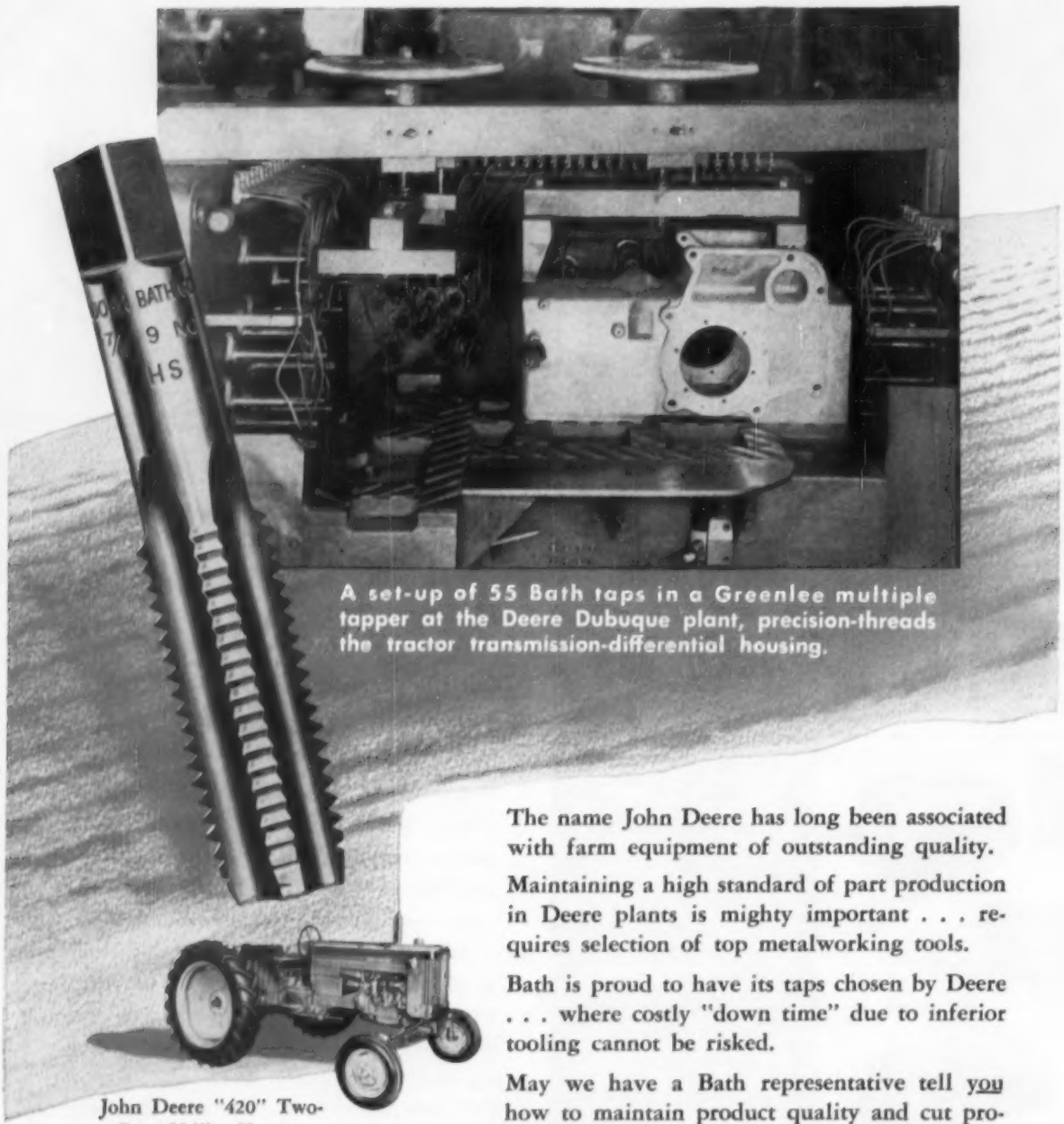
New precision machine tools call for precision drives. That's where Louis Allis fits into *your* picture. Louis Allis has the exact unit you need because it has the most complete line of motors and drives available to industry.

And if one of Louis Allis's wide range of stock motors doesn't exactly fit your job's requirements, you can get prompt delivery on a unit specially designed to give you the electrical or mechanical characteristics you need. Call your nearby Louis Allis Sales Engineer for motor application assistance on your problem.

THE LOUIS ALLIS CO.

MILWAUKEE 7, WISCONSIN

another Bath Tap job well done ....for JOHN DEERE



A set-up of 55 Bath taps in a Greenlee multiple tapper at the Deere Dubuque plant, precision-threads the tractor transmission-differential housing.

John Deere "420" Two-Row Utility Tractor

The name John Deere has long been associated with farm equipment of outstanding quality.

Maintaining a high standard of part production in Deere plants is mighty important . . . requires selection of top metalworking tools.

Bath is proud to have its taps chosen by Deere . . . where costly "down time" due to inferior tooling cannot be risked.

May we have a Bath representative tell you how to maintain product quality and cut production costs!

JOHN BATH & CO., Inc.
22 Grafton St., Worcester, Mass.
CYLINDRICAL AND THREAD GAGES · GROUND THREAD TAPS · INTERNAL MICROMETERS

There's more in this barrel for you...

S. F. Ketcham, Socony Mobil Field Consultant, analyzes oil circulation system design at drafting board stage.

MORE MACHINE BUILDERS' APPROVALS
to help improve production and lower unit costs

Specify Socony Mobil—and you get petroleum products approved by more machine builders than those of any other oil company. And no wonder. Our engineers have always worked closely with designers and builders. They advise on hydraulic and lubrication system design . . . suggest *correct* products for each machine—to help improve your production, lower unit costs.

Socony Mobil products are also backed by *more* field engineers serving industry . . . *more* services for analyzing petroleum products in use . . . *more* on-the-job training of your personnel in correct product application . . . *more* continuous research to assure continually improved products . . . *more* practical experience—90 years!

• • •

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS

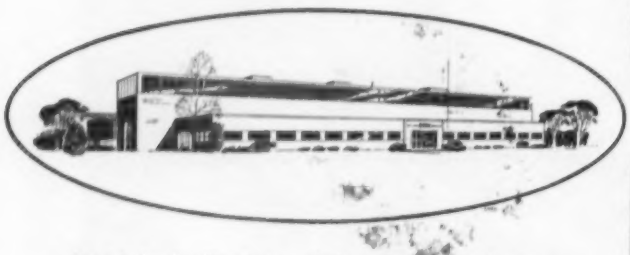
BATH

headquarters for metal forming...

"Complete Metal Forming Service" is a byword at the Cyril Bath Company. Recognized leaders for over 40 years, Bath manufactures a complete line of Power Presses, Press Type Brakes, Tangent Benders, Multi-Form Sequence Presses and Radial Draw Forming Machines.

If you need production, the Metal Form Division will produce your parts to specification. Its Engineering Department and complete plant facilities are at your disposal.

Inquire today about Bath's complete service. Your inquiry, prints or samples of your specific requirements will receive prompt attention.

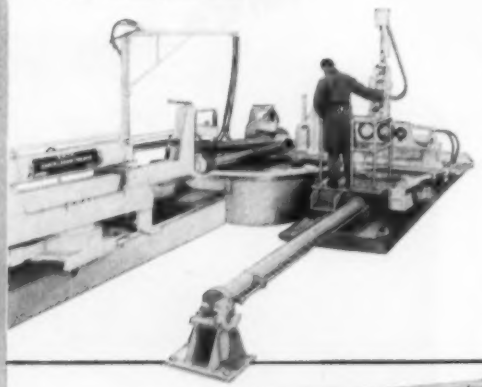


Send today for literature on Bath products or service. Catalogs on Stock Press Brake Dies, Power Press Brakes, Bath Press Type Brakes, Tangent Bending Sequence Presses, Aircraft Contract Forming or Stretch, Compression and Radial Draw Forming are yours for the asking. They contain a wealth of information on metal forming . . . from simple blanking and bending to forming of complex parts.

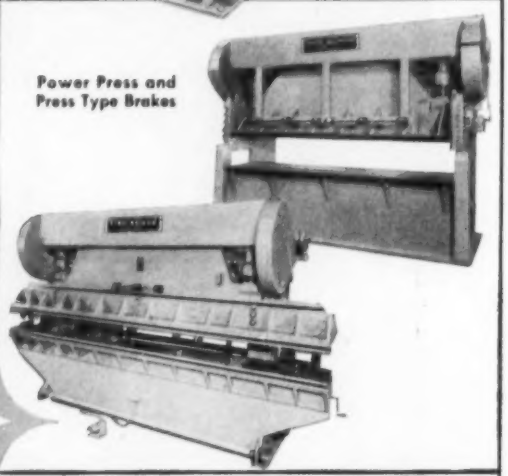
THE CYRIL BATH COMPANY

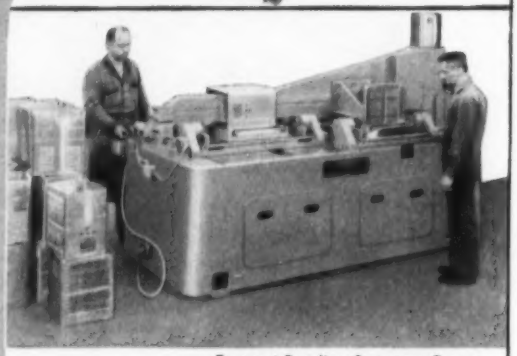
32340 AURORA ROAD • SOLON, OHIO
(LOCATED IN THE GREATER CLEVELAND AREA)
Manufacturers of Radial Draw Formers • Dies • Tools
Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

Stretch, Compression or Radial Draw Forming Machines



Power Press and Press Type Brakes





Tangent Bending Sequence Presses

Stretch, Compression or Radial Draw Contract Formed Parts

CUSHMAN chucks

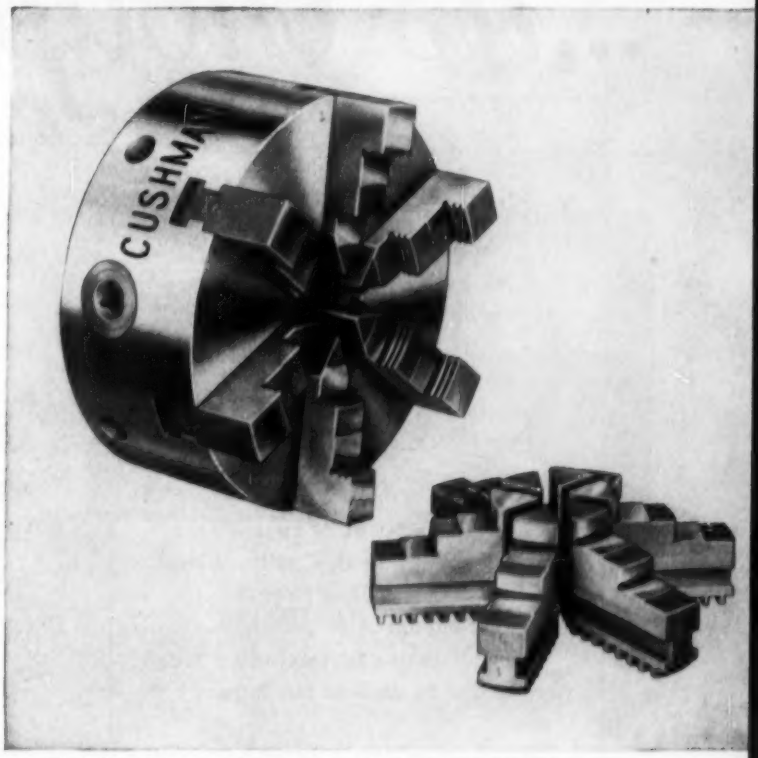
give Chuck-ability

CHUCK-ABILITY: The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . .through design and selection of the right work-holding devices.

. . . the New Accra-Set* Chucks

- Ideal for precision bar work.
- Quick, simple, minute adjustment.
- Repeats within .0005" or better T.I.R.
- Rigid body with positive locking eliminates rotational slippage.
- Because of extreme accuracy and jaw capacity, one Accra-Set* Chuck can replace even the most accurate collet chuck and its range of collets.

*Patent applied for.



Available with 3 or 6 jaws in 6", 8" and 10" sizes.
Adapter plates required for mounting.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut
a world standard for precision

CUSHMAN CHUCKS . . . a Product of American Quality, Labor and Materials.

CUSHMAN CHUCKMAN CHUCKS

SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:
Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushma
Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaw

The Big Trend in Metalworking...

MOVE the metal ...it's cheaper than

HOW NEW METHODS SAVE BIG SUMS

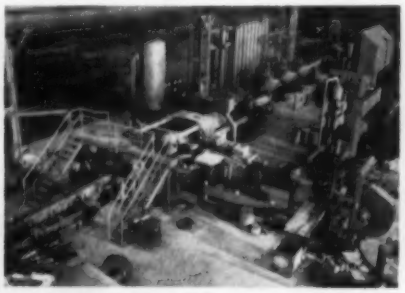
A. Parts are produced primarily by forcing metal into the desired shape rather than by "removing" or "machining" it. It is far faster... saves tremendously in time and labor.

B. The amount of metal in the initial slug, shot, billet, sheet, etc., is only slightly more than the total amount in the finished piece. Thus scrap and machining are held to an absolute minimum.

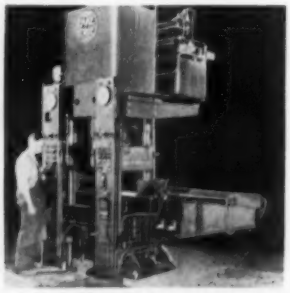
Metalworking plants casting about for ways to reduce production costs are turning more and more to the newer methods of forging, drawing and extruding in which metal is being "pushed around" rather than "removed." These processes basically are the hot extrusion of alloy steel, cold "pressure" forging of aluminum, cold extrusion of steel, and high pressure closed die extruding of aluminum and other non-ferrous alloys. Also falling within this category

Closed die extruding of heated aluminum reduced production time 99%.

Cold steel extrusion reduced scrap 43%



Hot alloy steel extrusion is now an established art.



Metal powder parts are often produced with no machining.

New and improved production techniques save millions...arouse widespread interest

1. Actual parts production is cut from hours in typical cases to minutes or even seconds.
2. Pieces generally have superior finish and improved physicals including grain structure.
3. Tolerances and uniformity equal or better those of older methods.
4. Scrap is greatly reduced and in many cases practically eliminated.
5. Unit costs go way down.

REMOVING it!

are somewhat older though greatly changed and improved methods for the extrusion of aluminum, hot forging of ferrous metals, powder metallurgy, deep drawing of sheet and die casting. The most recent developments involve variations and combinations of the above applied to many products and materials. Our engineers are in close daily contact with these developments. They'll be glad to help apply any of them to your production. Call or write us.

LAKE ERIE HYDRAULIC PRESSES

LAKE ERIE ENGINEERING CORP.

General Offices and Plant:
507 Woodward Avenue, Buffalo 17, N. Y.
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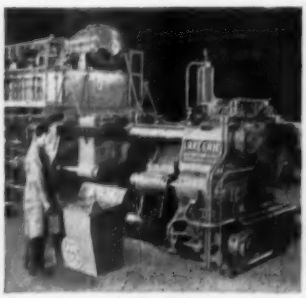
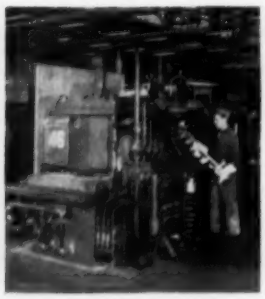
Representatives in Other U.S. Cities and Foreign Countries
HYDRAULIC PRESSES • DIE CASTING MACHINES
EXTRUSION PRESSES

New developments in steel forging have greatly expanded its application.



Non-ferrous extrusion installations now embrace titanium, magnesium and newer metals.



Production rates of die cast aluminum and zinc parts have been upped 20% to 30%.

"MOVE the METAL" is NOT NEW...

When this advertisement first appeared several years ago, it apparently sparked the current recognition of the "Move Metal" idea. Today the practice is widely accepted, acclaimed and growing. As the leader in the movement, Lake Erie will gladly share its experience with you.

LAKE ERIE

MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN

here's the way to BOOST PLANT CAPACITY on a limited budget

In thousands of plants, all over the country, engineers and maintenance men are making their equipment more automatic and more productive by installing MICRO SWITCH precision switches. These switches are famous for their space-saving size, dependability, rugged housings and easy installation.

Plant production is increased at the very minimum of cost. As machines are made more automatic, operators do more and better work. Work is done more quickly under the safer conditions that protective switches provide. MICRO SWITCH interlocks save costly machines, dies and materials from damage.

This multiplication of plant work capacity through the use of MICRO SWITCH precision switches is easily done. Products of MICRO SWITCH, a division of Honeywell, are readily available. They are sold by authorized distributors in key cities everywhere.

Why not put new life into your present plant equipment? Look under "Switches, Electric" in the Yellow Pages for the name of the distributor near you. For technical assistance on switch problems, call MICRO SWITCH Engineering Service at the nearest branch office.

Any of these catalogs will be sent on request

62 "Basic Switches" • 65 "Micro Switch Trip Control"
73 "Toggle Switches" • 74 "V3 Switches"
75 "Subminiature Switches" • 83 "Industrial Enclosed Switches"
90 "Mercury Switches" • 101 "Switches for Industry"

HOW MUCH IS A NEW PRODUCTION IDEA WORTH? MICRO TIPS DIGEST IS FULL OF THEM—WRITE TODAY

Problem—*To shut off motor when oil supply is low.*

Solution—Two HONEYWELL Mercury switches were attached to float in oil reservoir. When re-filling is needed first switch lights a warning light. If level becomes dangerously low, second switch shuts off motor.

Problem—*to stop needle breakage in knitting machine.*

Solution—Two metal-enclosed MICRO SWITCH precision switches were installed at upper and lower limits of knitting machine. They shut off current if thread breaks either above or below the cone.

Problem—*to avoid broken band saw blades because of improper tension.*

Solution—A MICRO SWITCH metal-enclosed switch is located on sliding sleeve at upper band saw wheel. When sleeve, which indicates tension, travels beyond danger point, switch turns on warning light.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

a MIGHTY fine press...

built to withstand rigorous service

From crown to base, Minster S1's are truly MIGHTY presses. You get these features as Standard Construction:

- ★ Box type cast construction for maximum rigidity
- ★ All wear surfaces bronze lined, precision fitted and replaceable
- ★ Minster patented Combination Multiple Disc Air Friction Clutch and Brake
- ★ Exceptional Slide guiding and barrel type adjustment
- ★ Air Counterbalances on slide
- ★ Totally enclosed gears running in oil
- ★ J. I. C. Dimensions

MINSTER
series **S1**
straight side single point presses

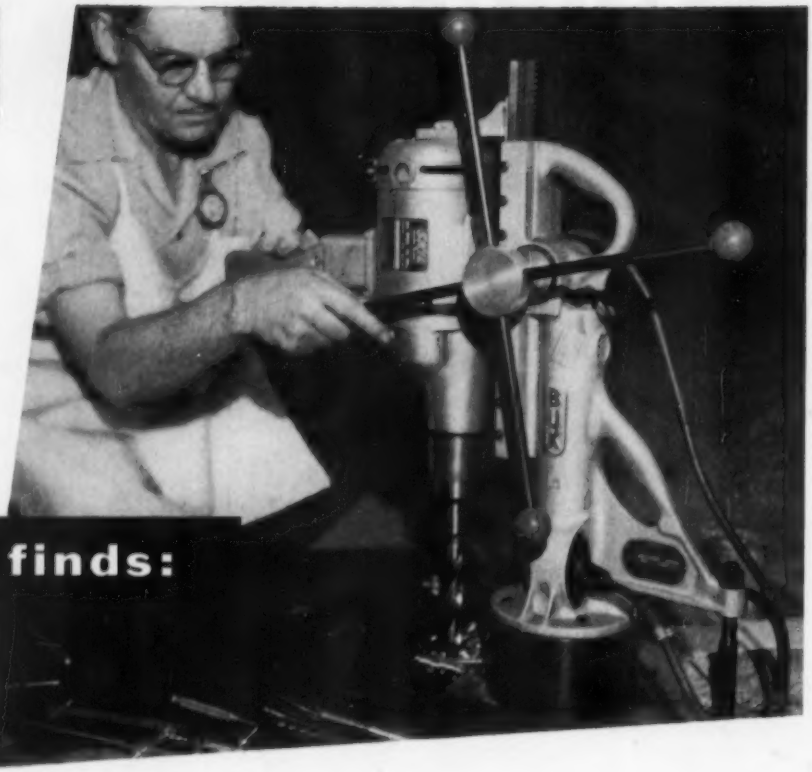
for drawing, forming, trimming or blanking.

capacities
from 50
to 600 tons

Photo courtesy of Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan. Minster S1-500 Press used in production of clutch coverplates for the automotive industry.

THE MINSTER MACHINE COMPANY
Minster, Ohio

MINSTER



CONVAIR finds:

"Bux Magnetic Drill Press saves us 28 man-hours daily!"

Read what Convair's Experimental Factory Superintendent J. N. McPheeters says about the performance of a Bux portable magnetic drill press:

"We drill critically-spaced 1 inch holes in heavy 12 foot "I" beams. With our Bux Model L-3, we replace a large radial drill, and eliminate 24 man-hours of set-up time a day! Besides cutting set-up time, we also save 4 more man-hours by not having to tie up a fork lift to haul the beams to the radial drill. And by using our Bux for drilling vertical surfaces, one man now does the work formerly done by two!"

Convair's experience is like that of thousands of other Bux users —work done faster, more conveniently, at less cost. Why not let your local Bux dealer give you a money saving demonstration? Or write us for complete catalog and specifications.

BUX
magnetic products

BUCK MFG. CO.
100 Roberts Rd., Los Gatos, California

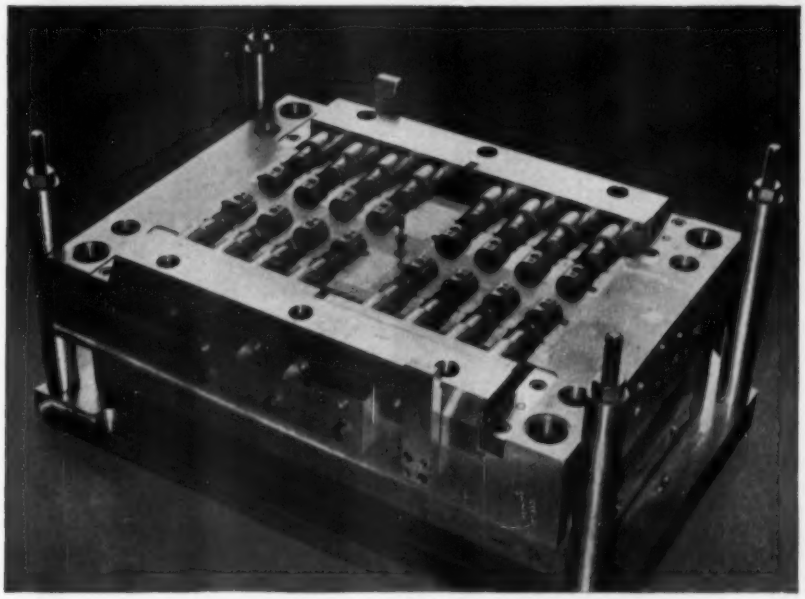
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributors: Bethlehem Steel Export Corporation



This die, made from Lustre-Die by Eagle Tool and Machine Co., Hillside, N. J., produces plastic part shown below.

Lustre-Die Tool Steel Fills Bill for Makers of Plastic Parts

So you're looking for high lustre! Just wait until you see the job you get when you use Lustre-Die, Bethlehem's new plastic-molding tool steel.

Lustre-Die is ideal tool steel for making plastic parts because it has properties which enable it to take such a high polish.

Sturdy and good looking, this plastic section for detergent can top was made from die of Lustre-Die.

One glance at Lustre-Die and you'll think you're looking in a mirror.

Lustre-Die is a special, electric-furnace steel of well-balanced analysis. It is alloy-fortified to increase its depth of hardenability and mechanical properties. It is also heat-treated by means of oil-quenching and tempering to a hardness of Brinell 302-352.

BASIC ANALYSIS

Carbon 0.50 Manganese 1.00 Silicon 0.30
Chromium 1.10 Molybdenum 0.25
(plus Alloy-Fortification)

Lustre-Die is such a clean, clean steel. It is carefully inspected to ensure freedom from porosity or surface pitting. Machining is easy, too, as the steel is free from nickel. Besides, there are no additives to cause inclusions, which could cause spotty areas on the die surface.

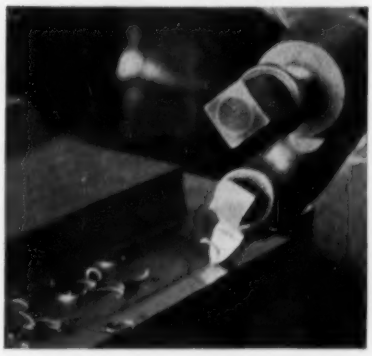
If you would like to purchase a trial piece of Lustre-Die, simply get in touch with your Bethlehem tool steel distributor.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Unusual Metal "Pickup" on Tools Is Caused By Carburization

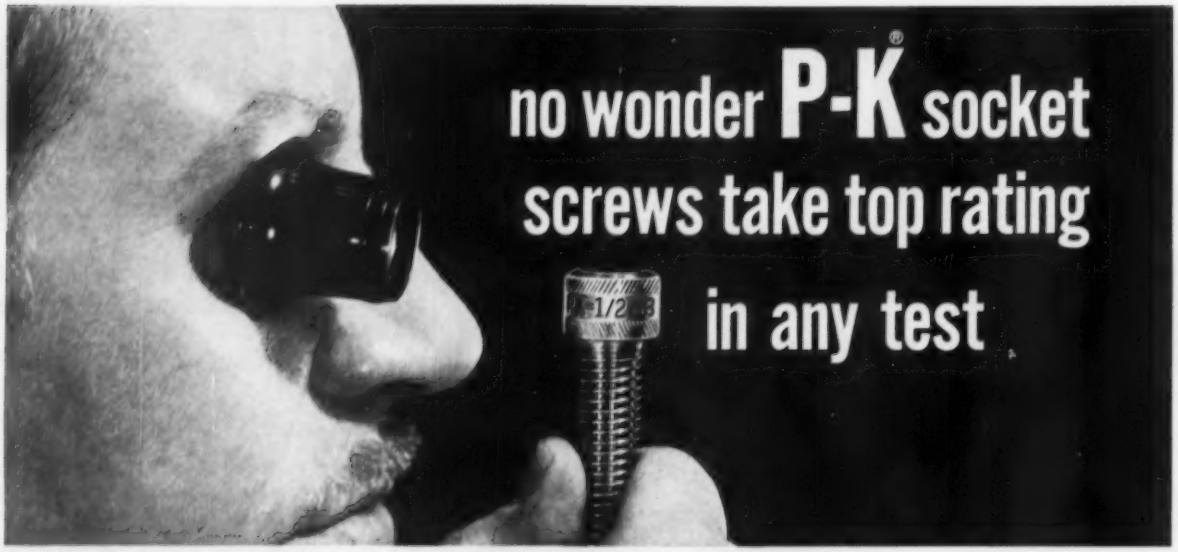
Metal "pickup" occurring on the surface of tools used in shearing, blanking or forming metal can be an annoying problem. When such "pickup" is routine and expected, it is customary to provide continuous maintenance to remove the adhering metal. But when it suddenly occurs in an operation normally free from "pickup," the trouble can be serious.

Recent investigations have shown that the most common cause of unusual "pickup" on tools is the unsuspected presence of an unwanted carburized case, unintentionally placed on the tools during heat-treatment, and therefore not removed by grinding after heat-treatment. On many grades of tool steel, a high carbon case causes retained austenite to form during heat-treatment. As the austenite is very soft, its presence on the surface of otherwise hard tools is sufficient reason to account for metal "pickup." A regrinding operation on the tool usually removes the austenitic skin, eliminating the trouble.



GOOD RESULTS WITH 66 HS

Bethlehem 66 HS (High-Speed) tool bits can always be counted on for smooth, steady cutting. In the operation illustrated, the 66 HS bit is shaping a bending die. 66 HS, because of its well-rounded 6-5-4-2 analysis, has all the properties needed for economical high-speed work.



no wonder P-K® socket screws take top rating in any test

ROCKWELL HARDNESS TEST. With this familiar laboratory device, the hardness of screws is carefully tested as a check on heat-treatment.

PERFORMANCE. Both the raw material and finished screws are tested on this equipment to determine ductility and strength under tension loads.

HEX DIMENSIONS. To make sure that the hex meets exacting specifications, a team of inspectors check dimensions across flats at the machine.

HEAD DIAMETERS. As heads are shaved on automatic machines, such as those shown here, constant checking by operator and inspector maintains accuracy.

THREAD CONTOUR AND LEAD. The Comparator permits checking of thread contour and lead of screw heads against Class 3A Tolerances.

SEE FOR YOURSELF

These are just a few of the steps in the rigorous test and inspection routine conducted in Parker-Kalon's modern fastener plant. Exacting quality control assures that all "doubtful screws" are eliminated—that every P-K Socket Screw delivered to you is first quality. Parker-Kalon guarantees that it's first quality. In strength, dimensional accuracy and overall uniformity, you can be sure . . . "if it's P-K, it's O.K."

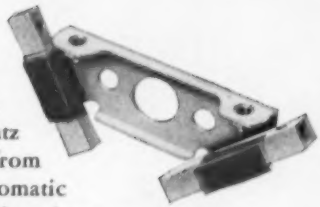
PARKER-KALON® fasteners

PARKER-KALON DIVISION, General American Transportation Corporation
Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws

Sold Everywhere Through Leading Industrial Distributors
Factory: Clifton, New Jersey—Warehouses: Chicago, Illinois—Los Angeles, California

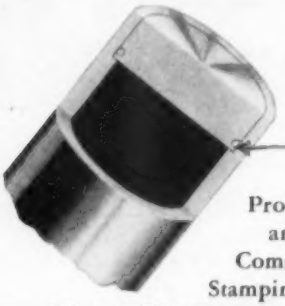
7 WAYS to SAVE MONEY with TOCCO* Induction Brazing

1



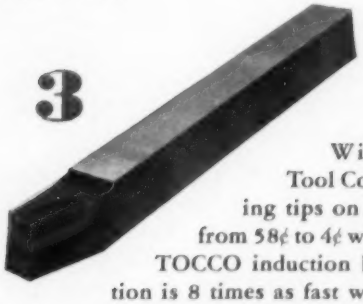
$15.84 per hour was saved by Jack & Heintz when they switched from torch brazing to automatic induction brazing of these inverter brush mounts. TOCCO brazing also upped production from 40 to 360 brazed assemblies per hour.

2



Production was doubled and cost cut 50% when Commercial Shearing and Stamping Company changed from welding to TOCCO induction brazing of these hydraulic cylinder assemblies. Heating time was cut from 15.3 minutes to 2 minutes on 5¼" cylinder shown here.

3



Willey's Carbide Tool Co. cut cost of brazing tips on large lathe tools from 58¢ to 4¢ when they adopted TOCCO induction brazing. Production is 8 times as fast with TOCCO—85 per hour, against 80 per day produced by a former method.

4

Formerly, Norris Thermador Corporation used arc welding to join this bushing and clamp. The change to TOCCO induction brazing reduced their costs 32%—from $46.44 to $31.73 per thousand parts.

5

When Mechanics Universal Joint Division of Borg-Warner shifted from welding to TOCCO induction brazing of this drive shaft assembly, they reduced the cost of the operation 67%. At the same time automatic TOCCO increased production from 11 to 45 pieces per hour—400% faster than the former method.

6

Packard engineers saved $1.74 per part when this automatic transmission shaft was redesigned from a forging to a steel shaft and casting, permitting the use of TOCCO induction brazing. In addition to this per part saving, $74,325 was saved in equipment and tooling.

7 Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for smililarly money-saving results—without obligation, of course.

THE OHIO CRANKSHAFT COMPANY

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NEW FREE BULLETIN

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Dept. B-11, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering."

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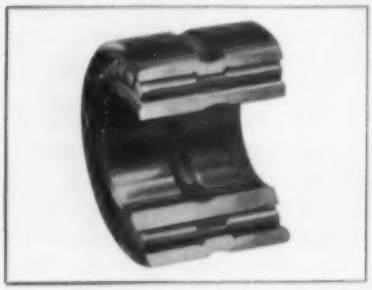
BEARING TIPS by McGill

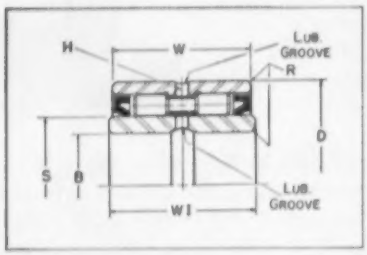
CAGELESS BEARING CORRECTS SKEWING

Guiderol Bearings carry greater loads in smaller spaces because they have no space wasting cages. A full complement of center grooved rollers extends the width of the race for maximum load support and a center guide rail avoids roller skewing that can bind a bearing under some loads. MT and CT series interchange dimensionally with ordinary needle bearings and cylindrical roller bearings.



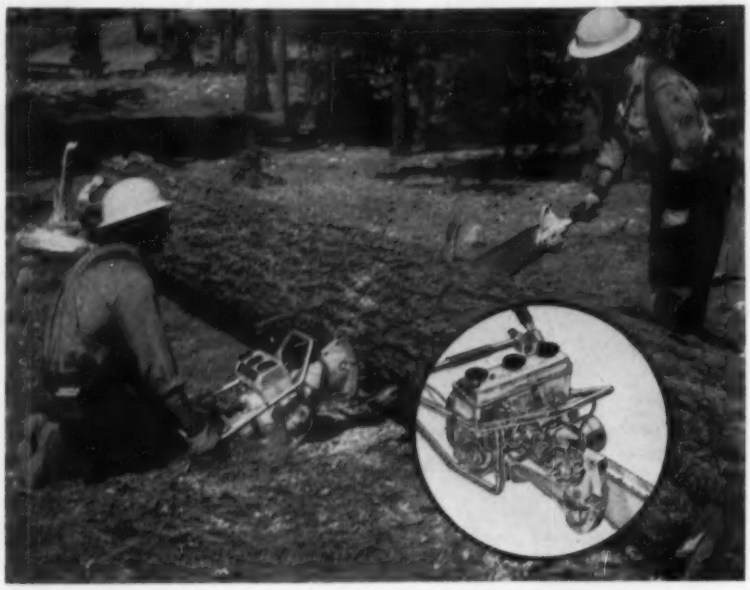
First Sealed Full Type Roller Bearing Series

The SG series Guiderol bearing provides low-cost and flexible sealing where ordinary needle-type bearings with auxiliary seals have been too cumbersome and expensive. Interchangeable with the standard Guiderol bearing, the new SG series provides five sealing combinations.



140 Pages of Bearing Facts

Write for your copy of Catalog No. 52, a revised 140-page Bearing Selection Guide. It contains vital product information and 30 pages of engineering data.



GUIDEROL® BEARING CARRIES GREATER LOAD IN SMALL SPACE FOR McCULLOCH CHAIN SAWS

Bearings installed in 1944 still in use.

Load-carrying capacity in minimum space is given as the reason for using McGill Guiderol bearings on the heavy-duty loader made by the Farmhand Company. Four bearings support the shafts of the gear pump that furnishes hydraulic power to the loader. Guiderol bearings have been used by Farmhand since 1944 and virtually all of the loaders with the original bearings are still in use.

Assembly ease cited as an extra benefit

Rugged use in the field dictates rugged construction at the factory for McCulloch Motors Corporation gasoline engine chain saw units. The one-man and two-man chain saws must be light and compact but sturdy enough to operate at full capacity all day long.

Since switching to a McGill Guiderol Bearing as support for the crankshaft, McCulloch, like many machine builders, has proved that the Guiderol bearing provides the desired greater load capacity in small space and outlasts former units with minimum maintenance—important under rugged chain saw field conditions.

A bonus benefit is the ease of installation of the Guiderol bearing—with open ends and no end shoulders. Assembly is a simpler operation.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL
Full Type Roller Bearings

McGILL MANUFACTURING COMPANY, INC., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA

carbide NEWS

The Wesson Study Tells You:

1. To what extent your own industry is already using single point tools with throw-away tips.
2. What the future plans of your industry are with regard to use of throw-away tooling and why.
3. To what extent your industry is considering the use of throw-away blades for milling, boring, etc.
4. To what extent plants of your size can use throw-away tooling effectively.

WESSON can also help you select the right kind of throw-away holders and tips to give you maximum performance and economy, cut machine down time, reduce inventory and improve product quality.

Ask us to prove it.

WESSON makes national survey data available

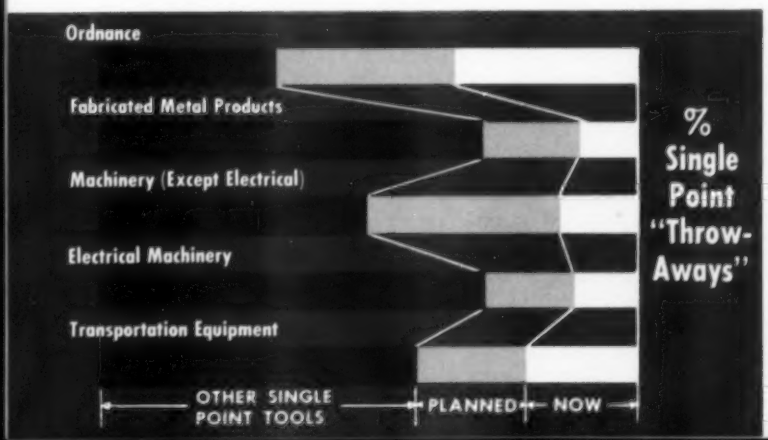
Industry Reports Big Jump in Use of Throw-Aways

HOTTEST NEWS in the carbide tool field right now is the astounding growth in popularity of "throw-away" tooling as revealed by the survey of metalworking industries by Wesson Company.

Conducted through an independent technical market research organization, the study shows:

1. Industry is seriously considering assigning a majority of all single point tool operations to "throw-aways". Some plants are thinking in terms of "as near 100% as possible".

(continued on next page)



THE BIG THREE IN THE THROW-AWAY FIELD---

#1 INDUSTRY SAYS IT WANTS the features which WESSON has incorporated in all of its holders for single point tooling with indexable disposable tips, including STANDARD REPLACEABLE PARTS, ADJUSTABLE CLAMP WITH CARBIDE FACED CHIP BREAKER, ONE PIECE ANVIL LOCATOR, etc., etc. If you are not familiar with these holders, be sure to ask us for complete data covering holders for your types of operations. Our Bulletin 55-11-M will help you to do this quickly.

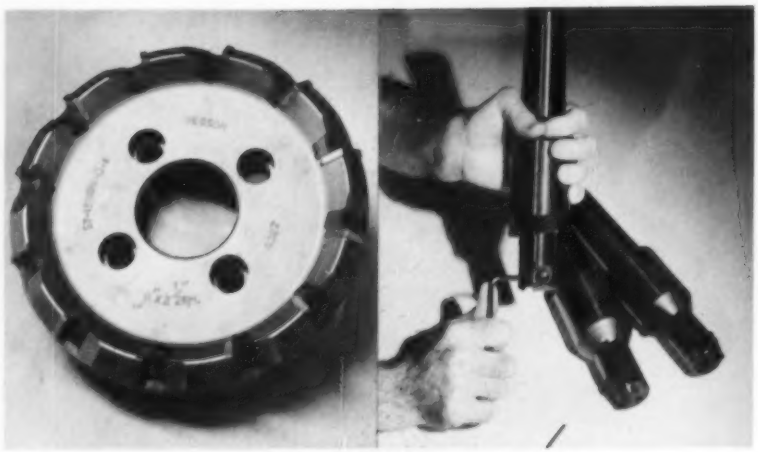
Industry Reports Big Jump in Use of Throw-Aways

(continued from page 1)

2. "Throw-aways" already represent over 15% of all single point tooling in metalworking plants. In those plants already using "throw-aways," the percentage is 25% of all single point operations.
3. Industry is receptive to the idea of using milling cutters that require no grinding on an even broader basis.
4. Industry is also seriously considering the use of no-grind (throw-away tipped) tooling for other multiple point tooling such as boring tools, etc. on a broad basis.
5. Primary reasons for industry's interest in tooling up with tips that are thrown away when dull are:
   a. Elimination of all tool grinding.
   b. Important reduction in machine down time for tool changes.

   Other factors include lower tool cost, reduced inventories, etc.

Included in the Wesson study are analyses of trends in the use of single and multiple point tools with throw-away tips by industry and by plant size (based on annual tool consumption). Results of the survey are available on request to all USERS of carbide tools.



THE BIG THREE IN THE THROW-AWAY FIELD - - -

#2 ***THE WESSON "NO-GRIND" Milling cutter, introduced at the Tool Show in Chicago promisss to launch a new era in milling in the metal-working industries, according to reports by the industry itself. Using disposable carbide tips with eight cutting edges each, it eliminates all cutter grinding, reduces milling cutter inventory, cuts overall costs per piece.***

#3 ***THIS MICRO-ADJUSTABLE BORING TOOL with no-grind disposable inserts is one of a series developed by Wesson. It has all the features, apparently, that industry is looking for.***

"No-Grind" Chamfering Tools Added to Wesson Standards

Two new holder styles designed for 30-degree and 45-degree chamfering operations have been added to Wesson's line of standard Multicut holders for throw-away carbide inserts.

The holders offer wide versatility, being applicable also to straight turning, plunge feed turning and facing operations. The 30-degree lead angle style designated TDRC-TDLC is also suitable for 90-degree shoulder turning by angling the holder in the tool block. The 45-degree lead angle holder style is designated SERC-SELC.

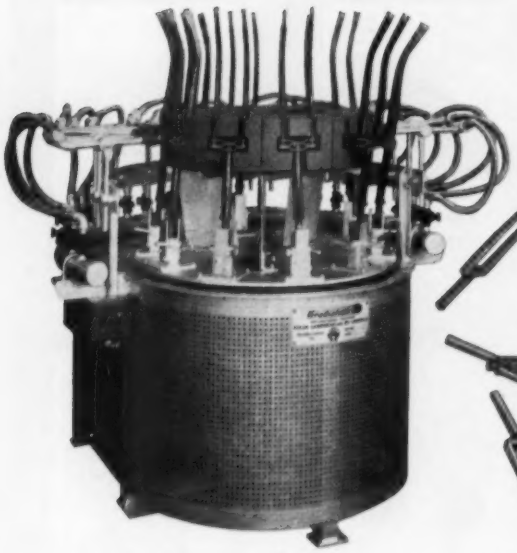
Both holders incorporate low cost, standard replaceable parts including a one-piece insert seat and locator, adjustable carbide faced chip breaker-clamp, and locking screw. The TDRC-TDLC employs standard triangular "No-grind" inserts while the SERC-SELC are designed for use of standard square inserts which provide a total of eight cutting edges before discarding.

The large clearances provided in the design of these holders make them especially suited for "gang" setups. Sizes available are shown on Bulletins 896-1A (SERC-SELC) and 896-2A (TDRC-TDLC).

Wesson tools carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.

IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 LEICESTER AVE., TORONTO 18, ONTARIO



Two fork styles in all standard bicycle sizes are joined from eight steel components, on this new automatic Selas machine, by Westfield Manufacturing Co., Westfield, Mass. Controlled combustion and flame geometry bring the parts to brazing temperature of 1750°F in only 86 sec, using low-cost natural gas.

Columbia

NOW PRODUCES 250 FORKS PER HOUR ...WITH AUTOMATIC SELAS BRAZING

Selas brazing is not new to Westfield, where Columbia bicycle frames have been Selas-brazed for several years in a production operation. During this time, preplacing of brass filler material and automatic heating have limited dependence on operator skill, reduced material waste, and eliminated costly cleanup operations. With the installation of the new Selas machine, these advantages have been extended to include fork manufacture, also.

For full information on how Selas brazing can lower your costs and improve your production, too, send for new Bulletin "Production Brazing and Soldering," and reprint, "Mechanical Heating puts Brazing on the Production Line." Address Dept. 311.

SELAS
CORPORATION OF AMERICA
DRESHER, PENNSYLVANIA

Heat and Fluid Processing Engineers

DEVELOPMENT • DESIGN • CONSTRUCTION

New Answers from Kling to Cut Your Costs in . . .

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- Bending (Plate and Structural)
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. . . and other operations involved in fabricating steel and non-ferrous metals.

Your answer may be a new Kling Universal Beam Punch equipped for automation . . . or a new Mill-All that does more facing jobs at lower cost . . . or a new Plate Bending Roll for rolling heavy plate sections such as airplane wing skins, pressure vessels, tanks, boat hulls, etc.

Whatever new Kling machine you need, you are assured that it will provide the newest, finest answer to your production problem. New answers to metal working problems have been a specialty with Kling for over 60 years. Why not give Kling engineering an opportunity to show what it can do in cutting your costs? Write today for Data Bulletins on the Kling machines shown above.

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Makers of Friction Saws; Shears—Rotary, Double-Angle and Guillotine; Punches; Combination Shear, Punch and Coper; Angle and Plate Bending Rolls; Bulldozers.

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1517

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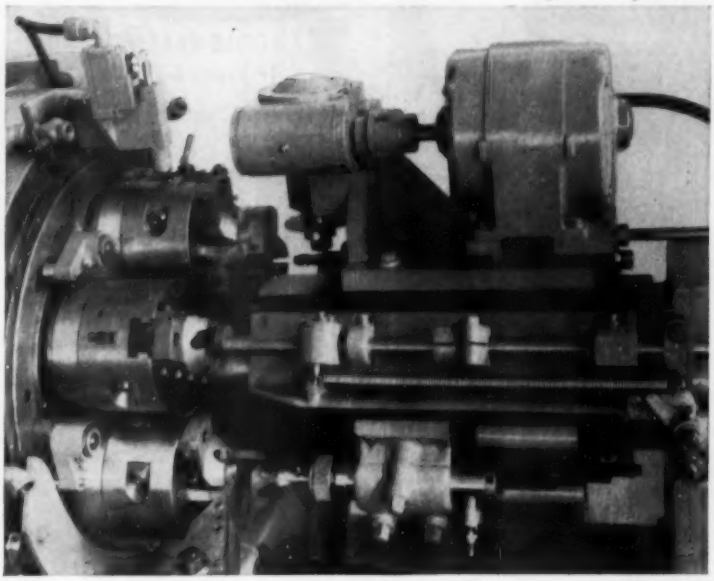
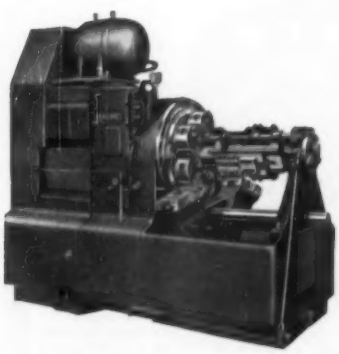
DRILL • BORE • REAM • RECESS • FORM RADIUS • MILL SLOT

44.5 seconds per piece



It pays to combine hard-to-handle operations on a versatile BAIRD 76H CHUCKER



industry's most versatile high production chuckers

A glance at this photograph will show you how straightforward and "clean" the arrangement is. Yet a wide variety of operations is being performed to close tolerances on a difficult workpiece.

A unique feature is the milling of the locating slot in the direct center of the part. The milling is accomplished by stopping and accurately locating the chuck. This locating slot is used on all subsequent operations on other machines. The forming of the shape on the lead of the hole, plus the grinding relief, is done by a combination slide with a form tool.

The outer face is machined from the cross slide, which incorporates a relieving motion to eliminate draw-back marks.

Sequence of Operations: Drill, bore and ream .735 - .739 center hole, face end, recess back of center hole for grinding relief, form radius on open end of hole (combination slide), and mill .1875 ± .001 locating slot.

Production: Cycle time 44.5 seconds per piece, 80 pieces per hour gross.

Every manufacturer who has installed Baird Automatic Chuckers knows them as rugged, dependable producers of amazing versatility . . . easy to re-tool when the job changes. We'll be glad to estimate and give our recommendations on your prints or samples. Write Dept. A.M.

Interested in Deferred Payment? . . . "ask Baird about it."

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

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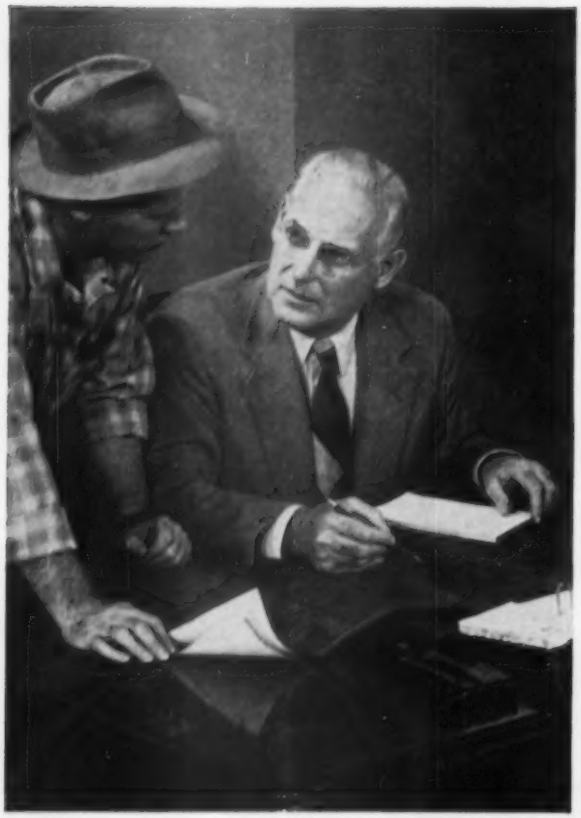

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Whether it's special tools, jigs, fixtures or even special machinery, you'll find that CDT can build them better, faster and more economically. That's why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool.

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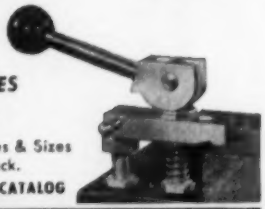
37 Types & Sizes

Note These Features—Reamed Holes—Hardened Serrated Bushings—High Tensile Strength Rivets

STANDARD FIXTURE CLAMPS
16 STYLES . . . 159 SIZES



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Ask for catalogs
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Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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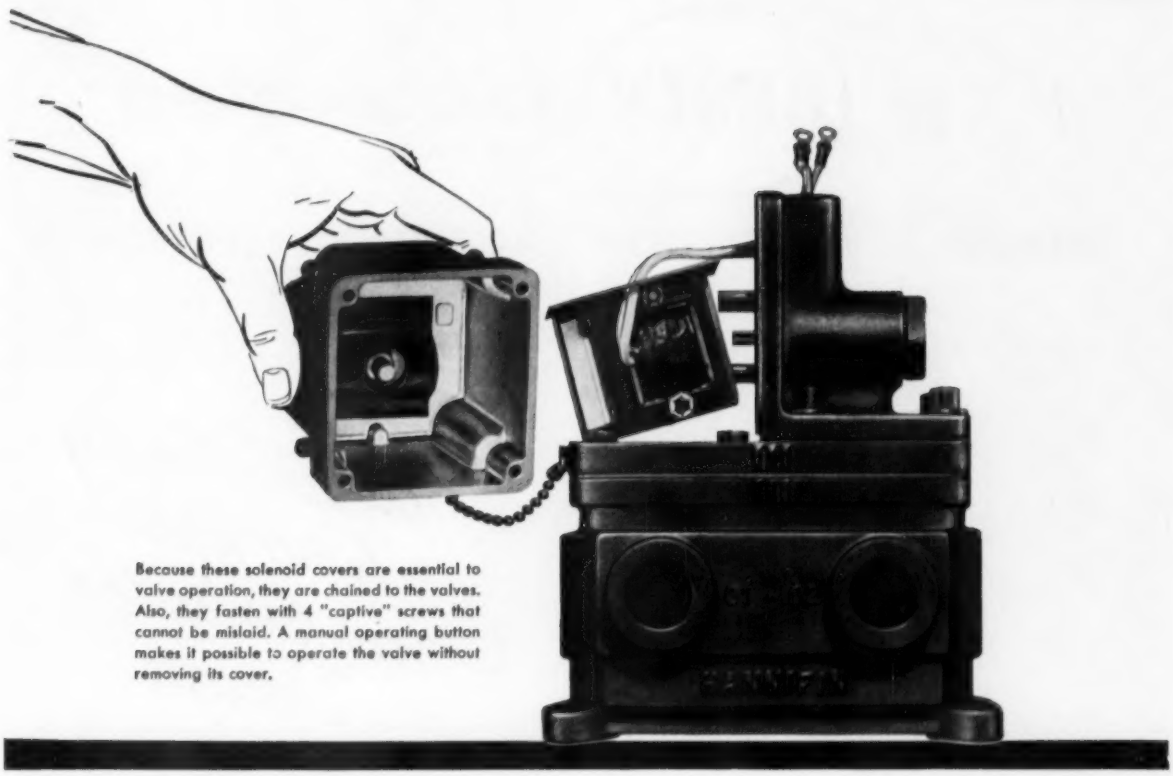
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301B NORTH 11TH ST., ST. LOUIS 6, MO.



Because these solenoid covers are essential to valve operation, they are chained to the valves. Also, they fasten with 4 "captive" screws that cannot be mislaid. A manual operating button makes it possible to operate the valve without removing its cover.

Now! solenoid-controlled air valves that defy improper maintenance ...they won't operate with their covers off!

When a solenoid valve operates without its cover, trouble is not far off. Dirt, oil, cutting fluid, chips are sure sooner or later to jam the solenoid, and the valve will fail to shift.

That can't happen with these new Hannifin valves!

The solenoids are held in place by their covers and won't operate the valves unless the dust-tight, splashproof covers are firmly tightened.

These new valves, which conform to the latest J.I.C. recommendations, are part of the complete "P-M" Pilot-Master line. New heads with these new solenoid covers are offered on 2-way, 3-way and 4-way Pilot-Master Valves (air-operated). The smaller, direct-operated 3-way and 4-way valves in the "P-M" line have been redesigned to use the same new covers. This added feature is just another reason why it pays to standardize on Hannifin air control valves.

AIR CONTROL

HANNIFIN

VALVES

Complete information on all Hannifin Air Control Valves is in this catalog. It belongs in your files. Write for your copy. Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois.

Grinds with "PUSH-BUTTON"

the BESLY No. 240-30"

DOUBLE HORIZONTAL DISC GRINDER

- **UNHEARD OF ACCURACY**
  .0001" for parallelism
- **PUSH BUTTON CONTROLS**
  from both sides
- **SEALED QUILL MOVEMENT**
  hydraulically operated
- **FOR GRINDING**
  piston and bearing rings, automatic transmission plates and similar shapes.

An Entirely New Idea in Grinder Design

This sleek, new, giant beauty has all spindle motors and other operating units contained within the broad, low, massive, easily accessible base . . . with push-button controls on both sides! An entirely new and improved grinder design that reduces maintenance, dressing, changes, and set-up down time . . . as much as ⅓ less!

With push-button control and at-a-glance reading of head and disc alignment . . . sealed spindle quill construction . . . automatic push-button dressing . . . automatic sizing to adjust disc wear . . . edge-grain Formica wearing ways . . . head assembly neoprene sealed against dust and coolant . . . fast through feed . . . and quick disc removal—the Besly No. 240 is the most *practical* grinder available today for high speed precision finishing of piston rings, bearing rings, automatic transmission plates and similar shapes.

Write for further information on this and other Besly machines for easier, faster, lower cost precision grinding. Better yet, ask our Besly Engineers to give you the answer to your toughest grinding problem!

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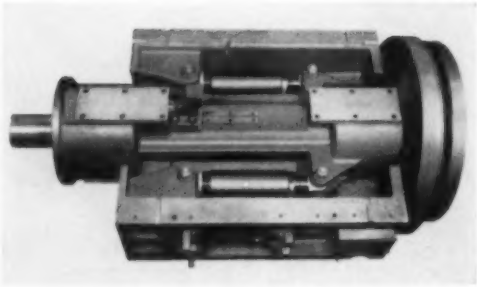
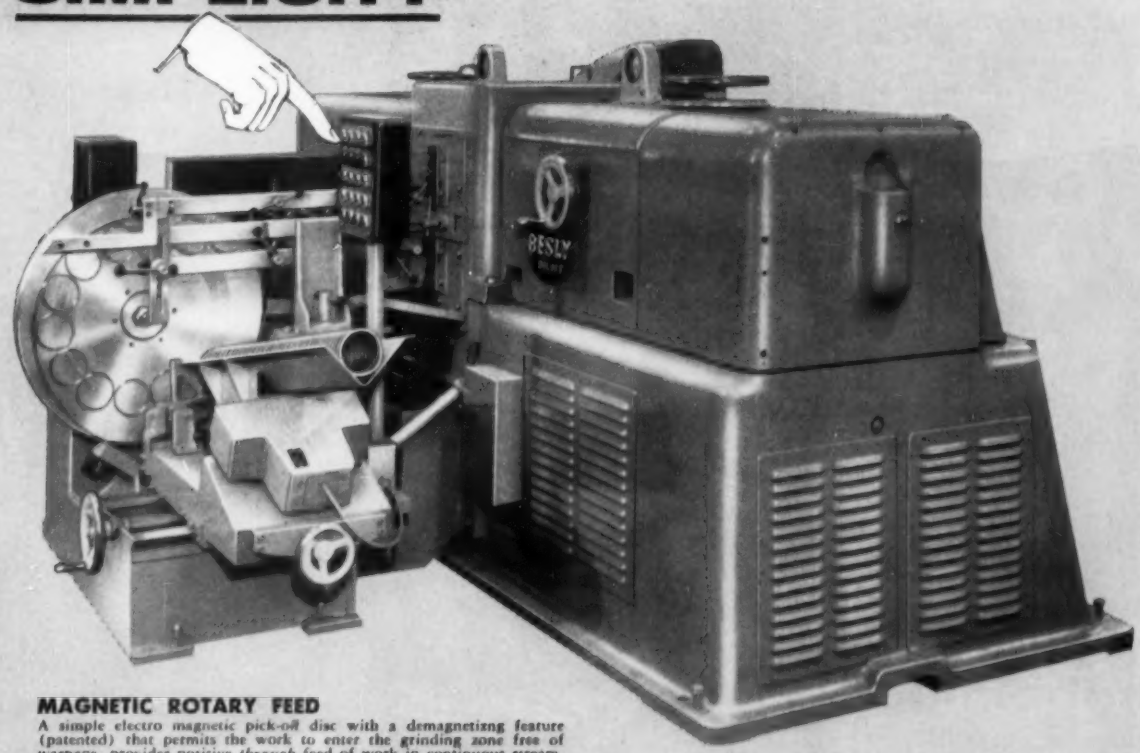


SEALED SPINDLE CONSTRUCTION

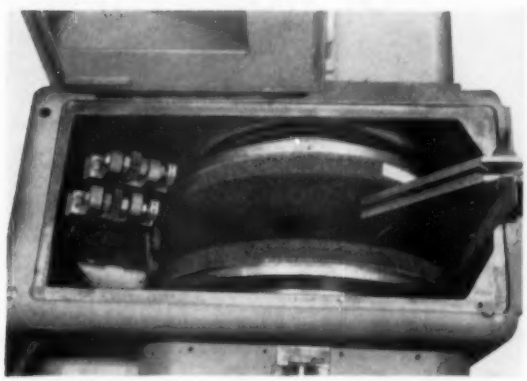
Removed from the motor and other mechanisms for vibration-free performance, the spindle sleeves are cradled in the head. They are moved in and out by a pair of hydraulic cylinders (visible above), sliding on six flat ways. These ways, edge grain Formica against steel, are grouped radially around sleeves, three in front, three in back. Upper way wear plates adjust up and down to provide take-up for wear. Spindle movement, 4½" max., is actuated by push button operated solenoid valves. Micro screws, operated by finely graduated handwheels, limit the movement toward and away from the work. Quick, perfect head and disc alignment sideways is made possible through head aligning device which provides at-a-glance readings in .005" graduations. The basic triangular shaped quill design used here is the same improved grinder feature introduced by Besly many years ago. It has definitely eliminated the problems of wear and inaccuracy commonly found in old-fashioned way construction.

SIMPLICITY



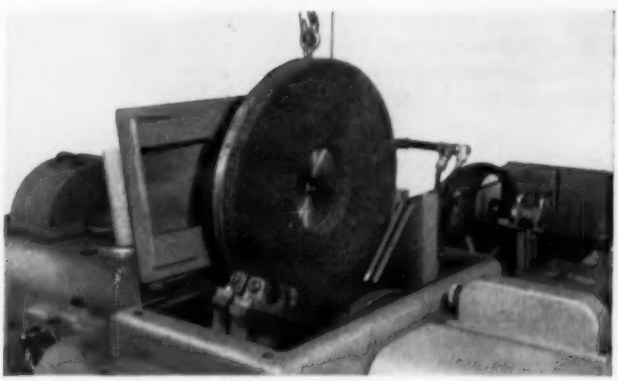
MAGNETIC ROTARY FEED

A simple electro magnetic pick-off disc with a demagnetizing feature (patented) that permits the work to enter the grinding zone free of warpage, provides positive *through* feed of work in continuous stream. This mechanism is quickly and easily adjusted for various parts diameters. Other feed mechanisms can be designed to accommodate shapes similar to piston rings, bearing rings and automatic transmission plates.



AUTOMATIC PUSH-BUTTON DISC DRESSING

Push-button actuated, hydraulically operated swinging arm abrasive dressers are provided. Mounted on the head they are always in alignment with the center line of the spindle. This assures perfectly flat discs regardless of the position of the head. This unique feature cuts dressing downtime to new lows.



EASY, QUICK DISC REMOVAL

Hood is made with a large, hinged opening to facilitate the replacement of worn abrasives. The 30" abrasive discs are removed by hoisting straight up without disturbing guide bars. Downtime due to abrasive changing is substantially reduced by this improved design feature.

BESLY

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Est. as C. H. Besly & Co., 1875

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Lees-Bradner

hobbing...

Lees-Bradner Gear Hobbers produce the precision gears that go into much of America's automobiles, tractors and industrial equipment. Seven different sizes and types of Federal Ball Bearings are used in these intricate tools, smoothing the way for trouble-free operation.

Toro Manufacturing

or hobbying...

This 10-inch tilting-arbor Toro Power Saw is the answer to a do-it-yourselfer's dream. It will rip through a 2 x 4 like butter, or cut a delicately contoured molding. Federal Ball Bearings on the arbor keep the 10-inch blade humming sweetly.

so much of industry *turns* on FEDERAL ball bearings

It's no longer a question of *where* Federal Ball Bearings are used, but rather where *aren't* they used? Wherever you look – in home, office or industry, Federal Ball Bearings are doing their anti-friction job with quiet dependability. 12,000 sizes. Hundreds of types. Produced by a 50-year-old manufacturer of ball bearings exclusively.

When Federal Ball Bearings are part of so many things you *use*, shouldn't they be part of the things you *make*?

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New! Ball bearing and engineering data! *175 pages full in* FEDERAL'S CATALOG! *To get your copy, just write us.*

Federal Ball Bearings

One of America's Largest Ball Bearing Manufacturers

☐ **"Waterbury" Automatic Nut Formers**

Cir. No. 930-A-2

Describes operation and illustrates design details of machine which can cold forge a wide variety of standard and special nut blanks as well as similar parts. Production rates range from 60 to 125 per minute depending upon size of machine. Gives specifications for 5 sizes ranging from ¼" to ¾" nominal bolt capacity. 8 pages.

☐ **Automatic Pinch Pointing Machine**

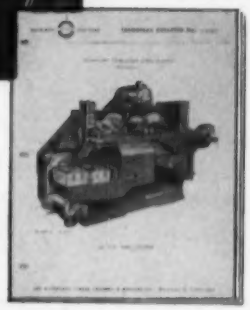
Cir. No. 742-A-2

Describes and illustrates rotor vane feed pinch pointer with maximum production capacity of 150 per minute. Max. blank diameter ¼". Max. length under head 2½". Min. length under head ¼". Shows typical work samples and gives table of specifications.

☐ **High Speed Threader**

Cir. No. 942-A

Describes and illustrates completely new type of thread rolling machine which uses planetary dies to thread up to 2,000 blanks per minute.



☐ **High Speed Screw Slotter**

Bul. No. 106-A-3

Describes and illustrates WF's revolutionary new slotter—production team-mate of the new threader. Uses single feed mechanism and single saw to slot up to 2,000 burr-free blanks per minute.

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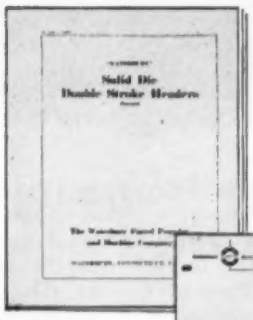
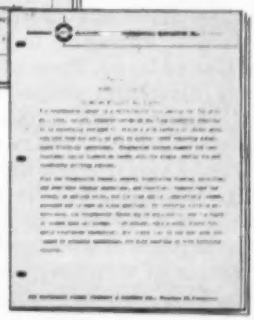


☐ **"Waterbury" Solid Die, Double Stroke Headers**

Cir. No. 933-A-2

Explains construction and operating features of crank type, two blow headers for producing the standard varieties of bolt and screw blanks as well as many special cold-forged products. Gives specifications for five sizes of long stroke and five sizes of short stroke machines handling wire diameters from 3/16" to ½". 8 pages.



☐ **"Waterbury" Progressive Headers**

Bul. No. 104-A-2

Covers features of multiple die cold heading machine which has roll feed, cut-off, transfer mechanism and four operating stations. Points out that machine can produce wide variety of headed work including hexagon head cap screw blanks and socket head cap screw blanks. Four sizes of headers are covered in the specification tables. 8 pages.

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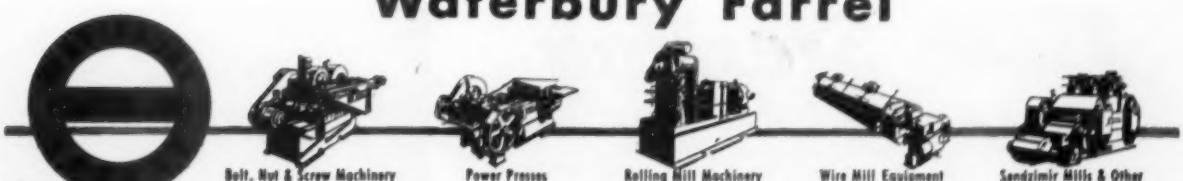

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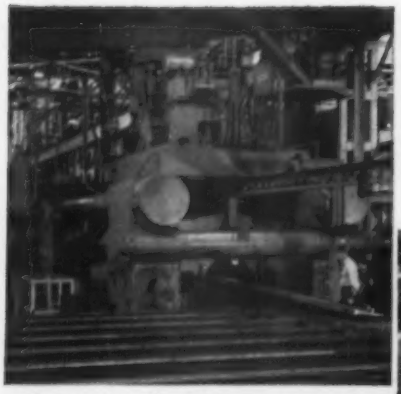

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CASE HISTORY No. 33—CAST STEEL BRAKE BASES

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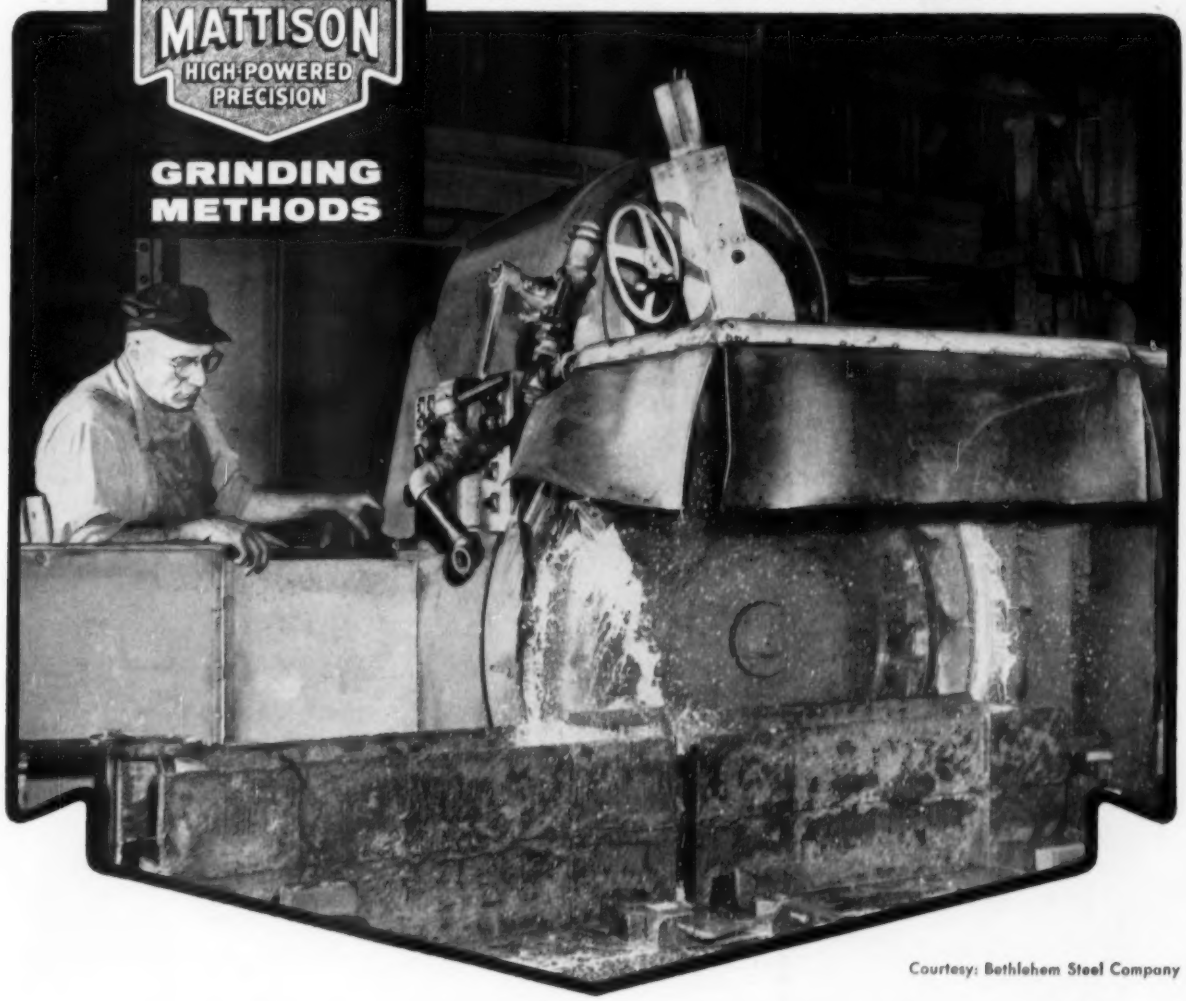
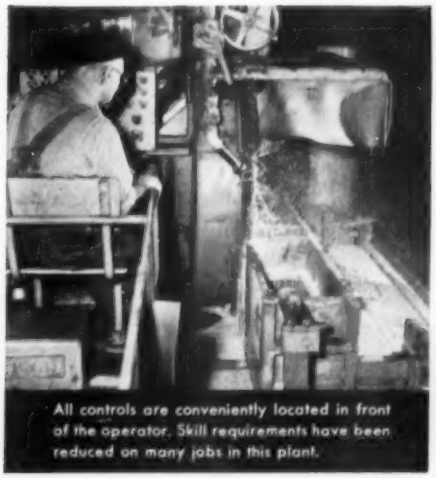


Courtesy: Bethlehem Steel Company

Switch from planer to face grinder boosts production 200 to 300 per cent



All controls are conveniently located in front of the operator. Skill requirements have been reduced on many jobs in this plant.

Large cast steel brake bases, formerly machined on a planer, are finished three to four times as fast and more efficiently on this Mattison "UK" Traveling Wheel Face Grinder. Surface finish has been improved considerably, and it is now easier to machine the brake bases to required accuracy limits. The machine is so simple to operate and easy to set up, operator skill requirements have been reduced with resultant savings in direct cost.

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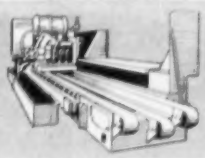

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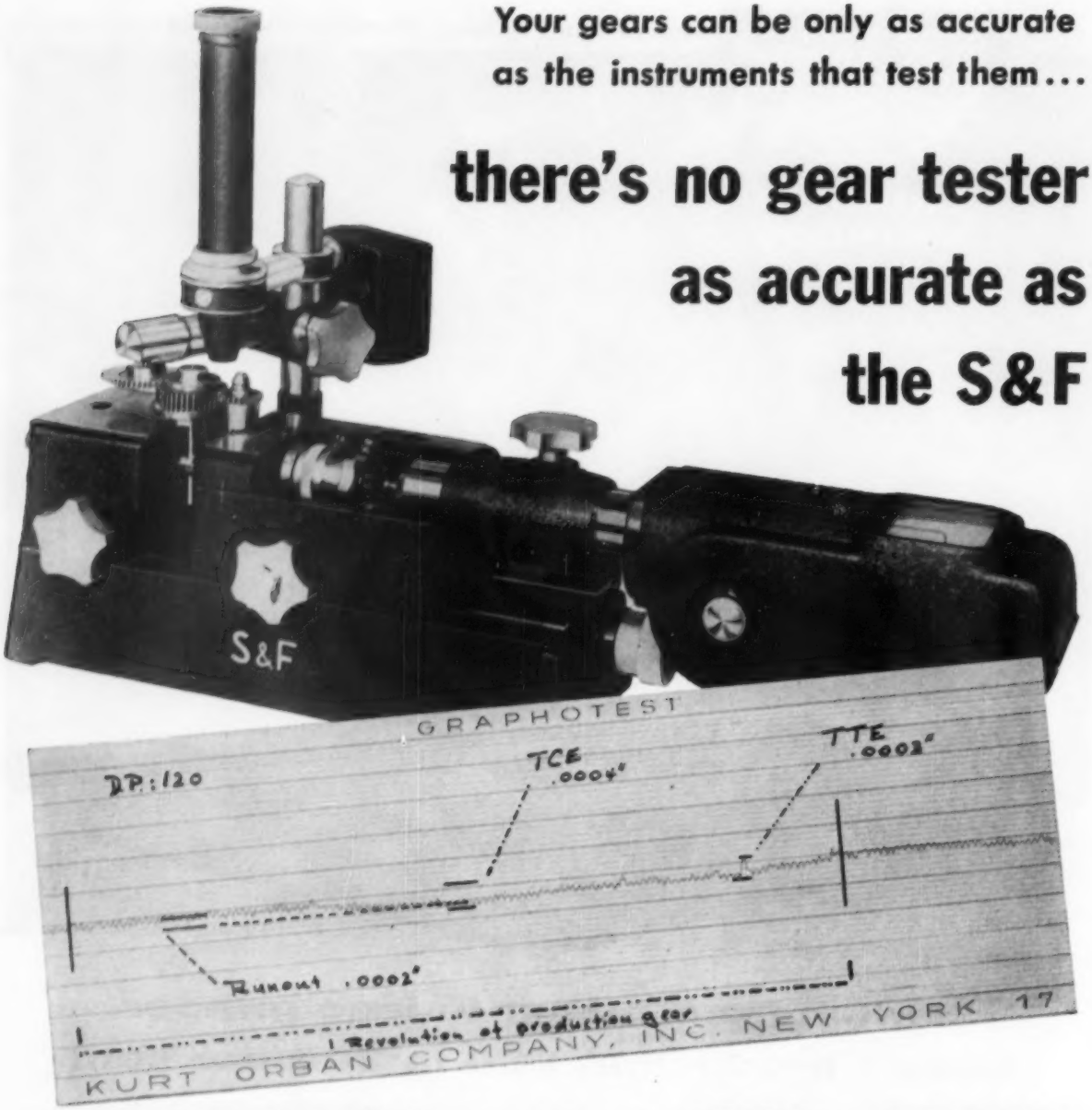

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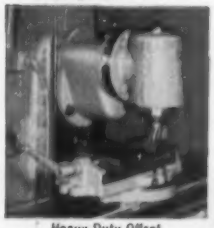

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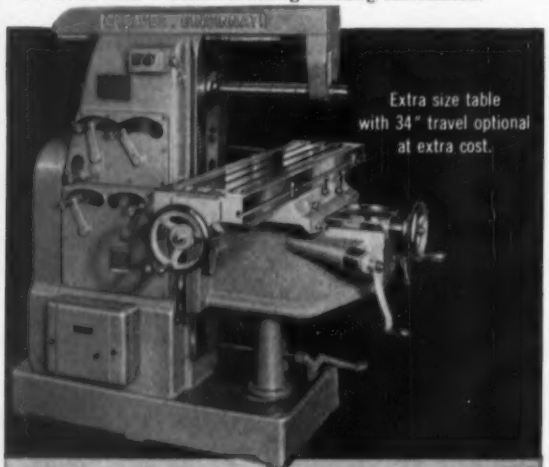

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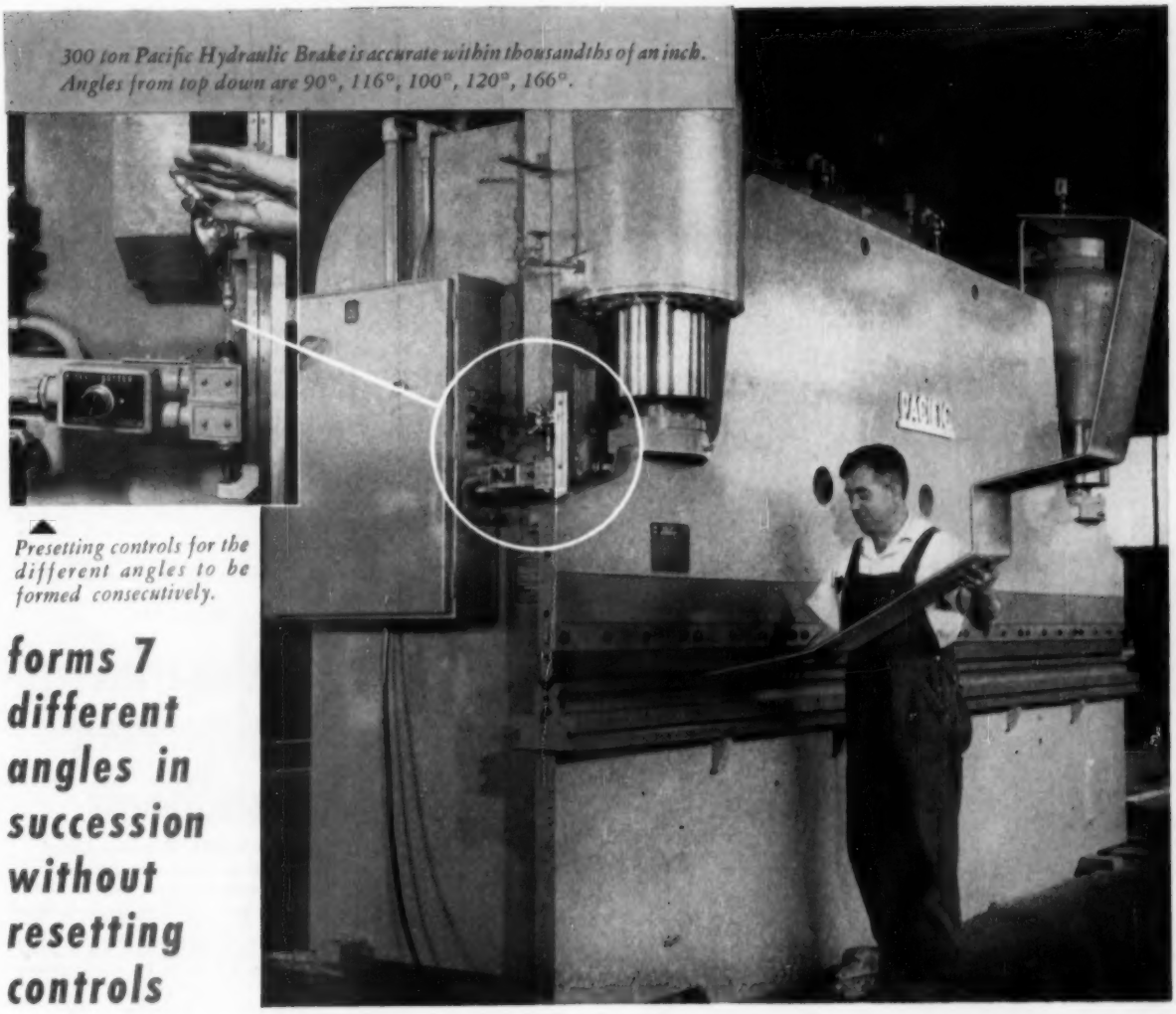

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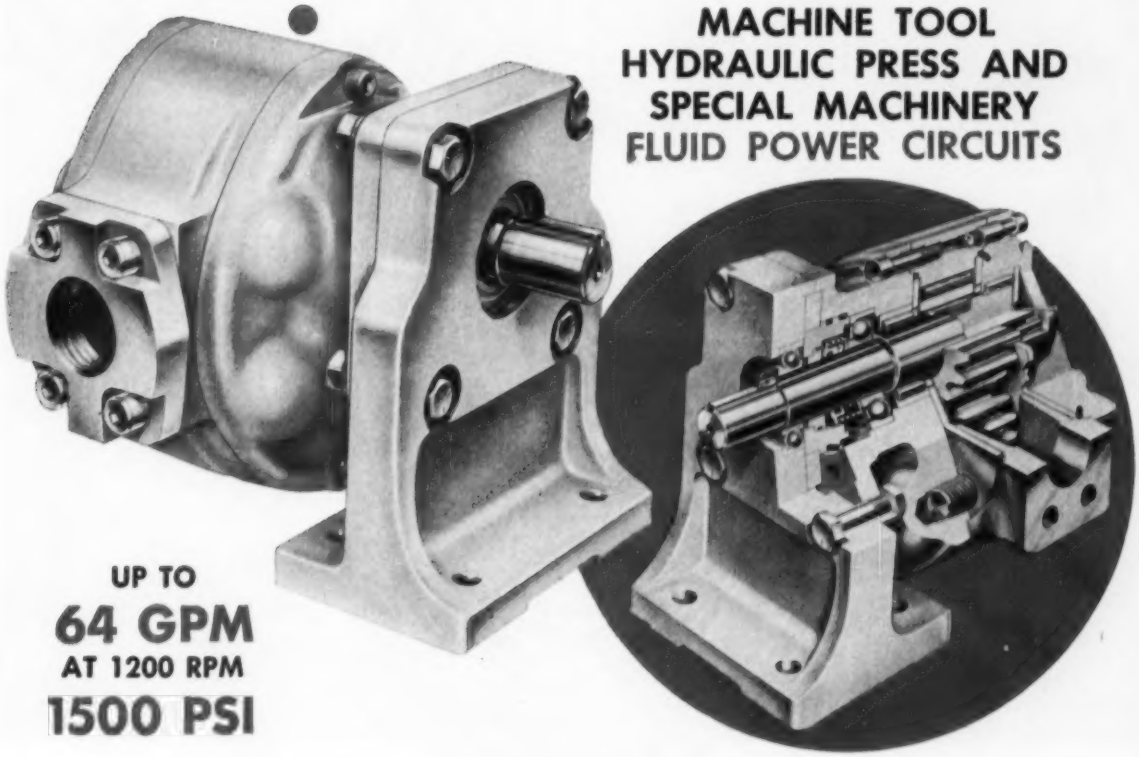

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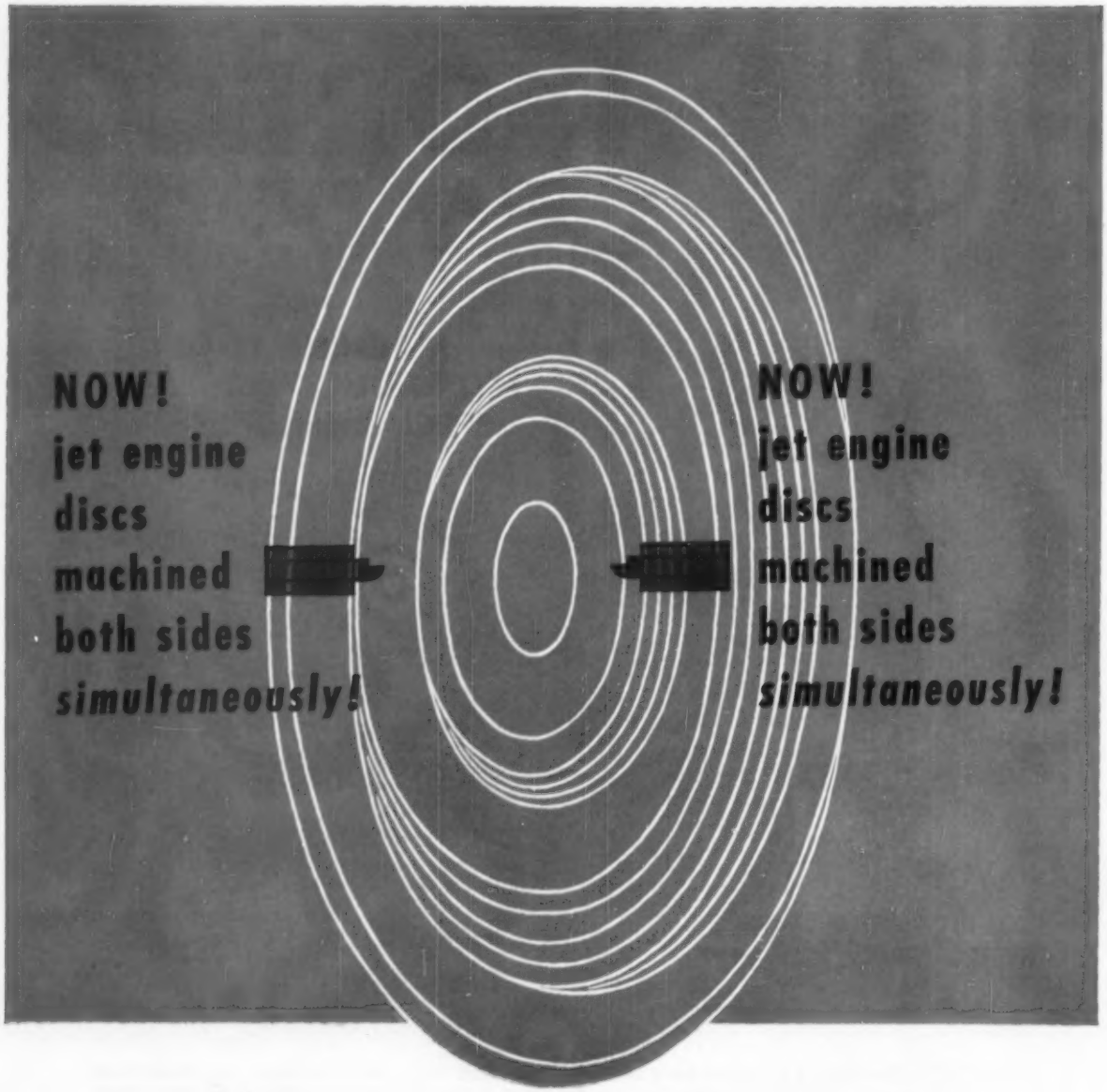

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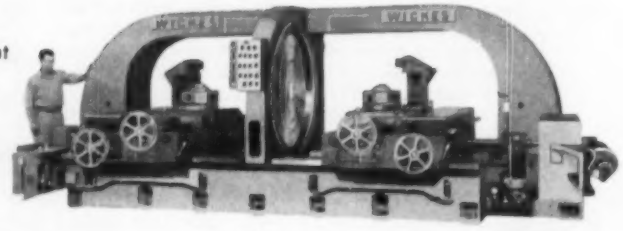

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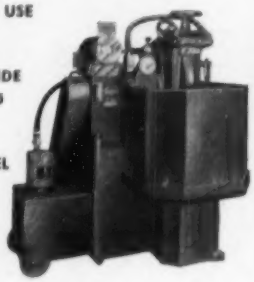

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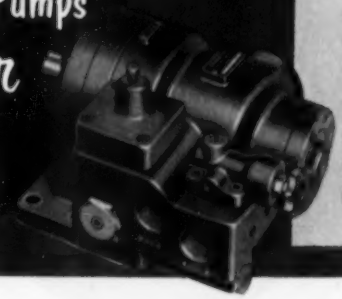

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High Volume @ Low Pressure for fast closing, rapid advance, and rapid return.

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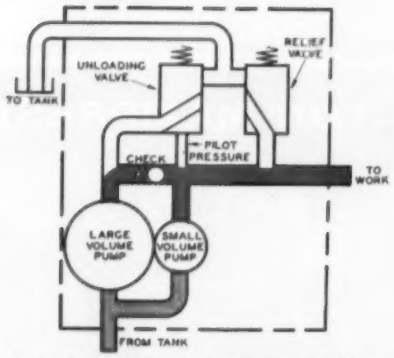

Fig. 1 Combined Delivery of Large and Small Volume Cartridges at Low Pressure

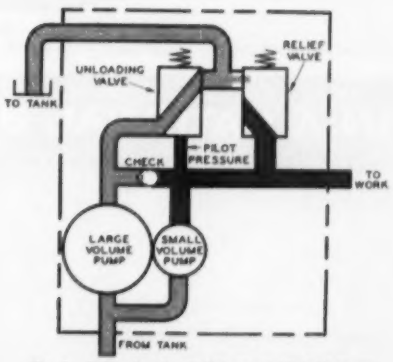

Fig. 2 Delivering Small Volume at High Pressure

Two Vickers Vane Type pumping cartridges are mounted on the same shaft—in the same housing, driven by the same prime mover. One provides a large volume of oil while the other delivers a small volume. These Vickers Two-Pressure Pumps have proved advantageous in a wide variety of applications.

For example, in closing a press or in rapid advance, both pump cartridges work together, supplying maximum volume for quick operation (see Fig. 1). When the press is closed and compression begins, or when the tool goes into feed immediately prior to beginning the cut, the large volume cartridge is automatically unloaded to the reservoir at zero pressure (see Fig. 2). The small volume cartridge alone then provides the lower volume required at high pressure.

These Vickers Two-Pressure Pumps are most economical in power consumption for such two-pressure operation. The reason for this is that a small-volume pump working at full capacity is MORE EFFICIENT than a large-volume pump working at partial capacity. Regardless of momentary delivery, the internal leakage of any pump is proportional to its size and operating pressure. The chart (Fig. 3) shows an interesting comparison between a Vickers Two-Pressure (Two-Volume) Pump and a variable volume vane type pump on a press circuit.

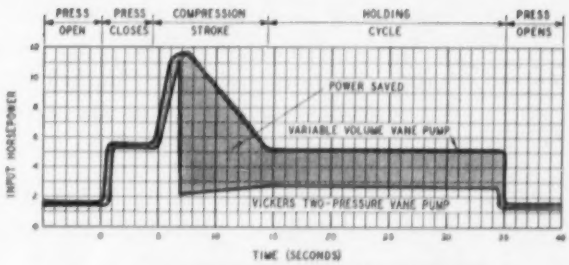

Fig. 3. On this typical press application the saving in power is approximately 50% with a resultant saving in heat in the system.

Like all Vickers Vane Pumps, these two-pressure pumps have the hydraulic balance feature that relieves bearings of all pressure loads (one of the major causes of wear). Cartridge construction enables customer to service in his own plant instead of returning to factory should repairs be necessary. Relief and unloading valves are integral . . . minimizing piping and connections. Complete range of sizes up to 48 gpm. For additional information, ask for Bulletin 54-70a.

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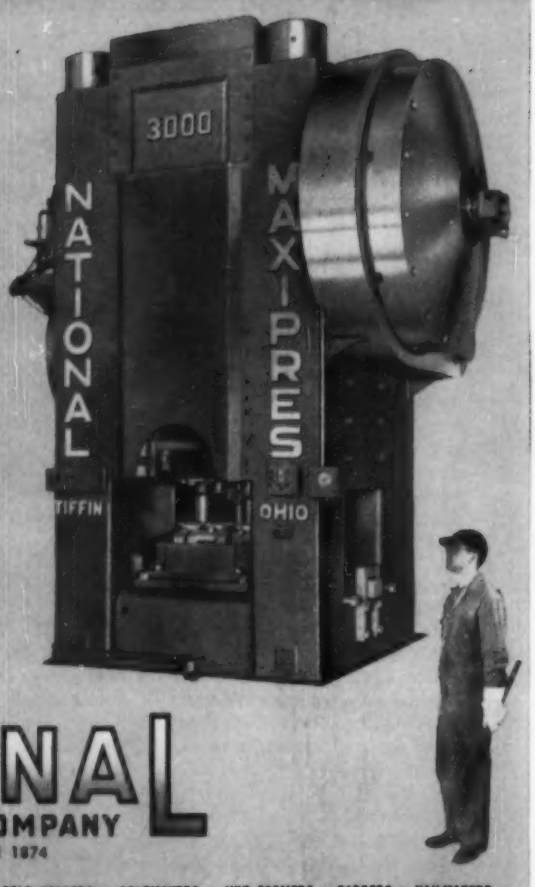

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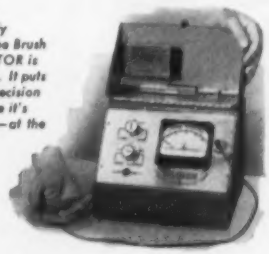

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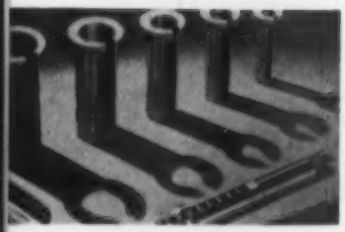

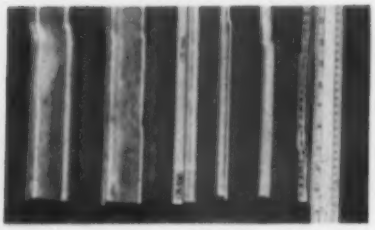

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in AM's 1957 Production Plan-book

The properties and uses of materials vital to every Metalworking shop or plant—cast iron, steel, copper, brass, aluminum, titanium, magnesium and alloys of these and other materials; whether sheet, plate or bar stock; many kinds of plastics; as well as new application ideas on such components as gears, valves, hydraulic and pneumatic mechanisms, electric motors and controls, bearings and numerous other parts and components incorporated into the finished products manufactured by Metalworking plants will be found in Section G "Nuggets."

"How-to-move-it" materials handling ideas and equipment—fork-lift and conveyor, crane hoist and pallet—plus many automation developments not classified elsewhere; and plant services such as inventory and work-in-process systems; waste disposal, salvage and ventilating and air conditioning ideas will appear in Section H.

Ready Production Guidebook

Other sections of the issue will contain time-saving "Nuggets" also classified by topic—management and personnel; machining and tooling; presswork, molding and casting; inspection, testing and quality control and assembly, heat-treat and finishing, as shown at right. Each production "Nugget" in each section will bear the issue date and page number of American Machinist from which it has been condensed for easy reference if you want more specific details, drawings, charts or diagrams and full text.

"Developments to Watch in '57"

Invaluable checklists of modern Metalworking ideas and techniques, a constant every-day challenge to boost production and guard against obsolescence, to be published in each section, will enable you to relate your operations to Metalworking plants all over the country.

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1957 OUTLOOK

MANAGEMENT, PERSONNEL A

MACHINING B

TOOLING C

PRESSWORKING, MOLDING, CASTING D

INSPECTION, TESTING, QUALITY CONTROL E

ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS) F

MATERIALS, COMPONENTS G

MATERIALS HANDLING, SERVICES H

PRIZE IDEAS, REBUILT EQUIPMENT I

BUYER'S GUIDE J

this 140-TON horizontal milling machine

also bores and turns

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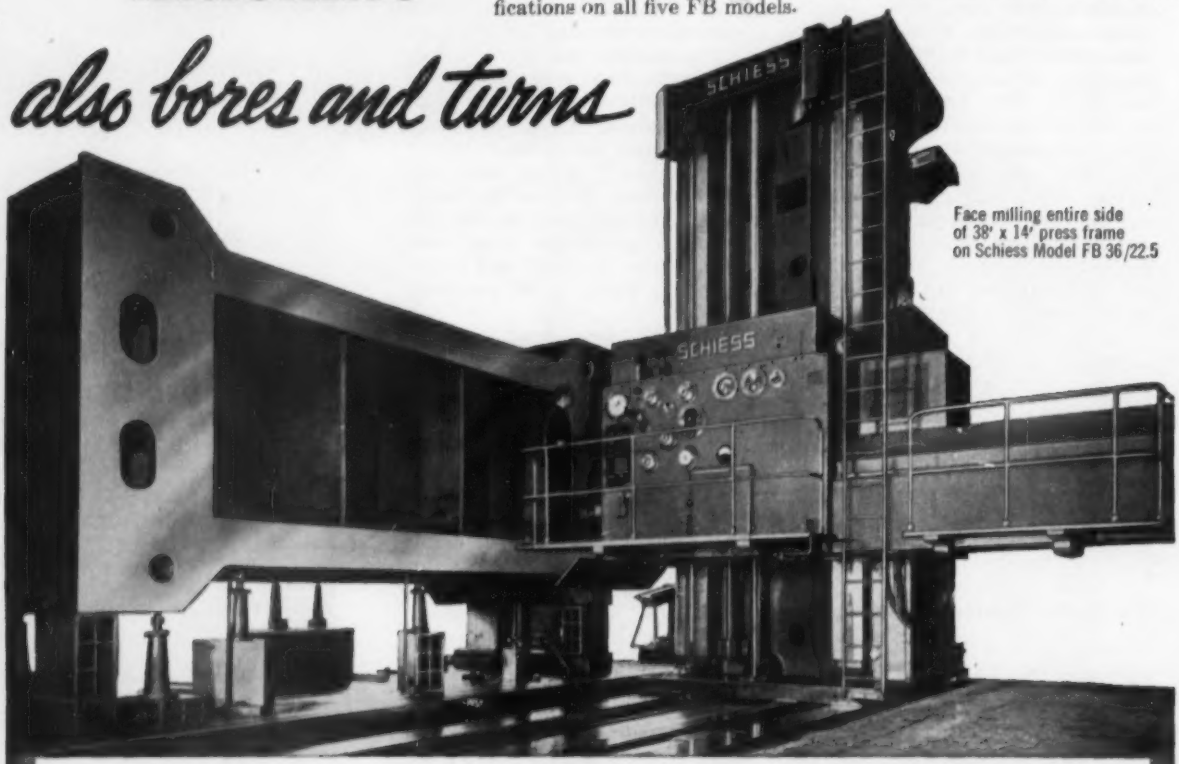

Face milling entire side of 38' x 14' press frame on Schiess Model FB 36/22.5

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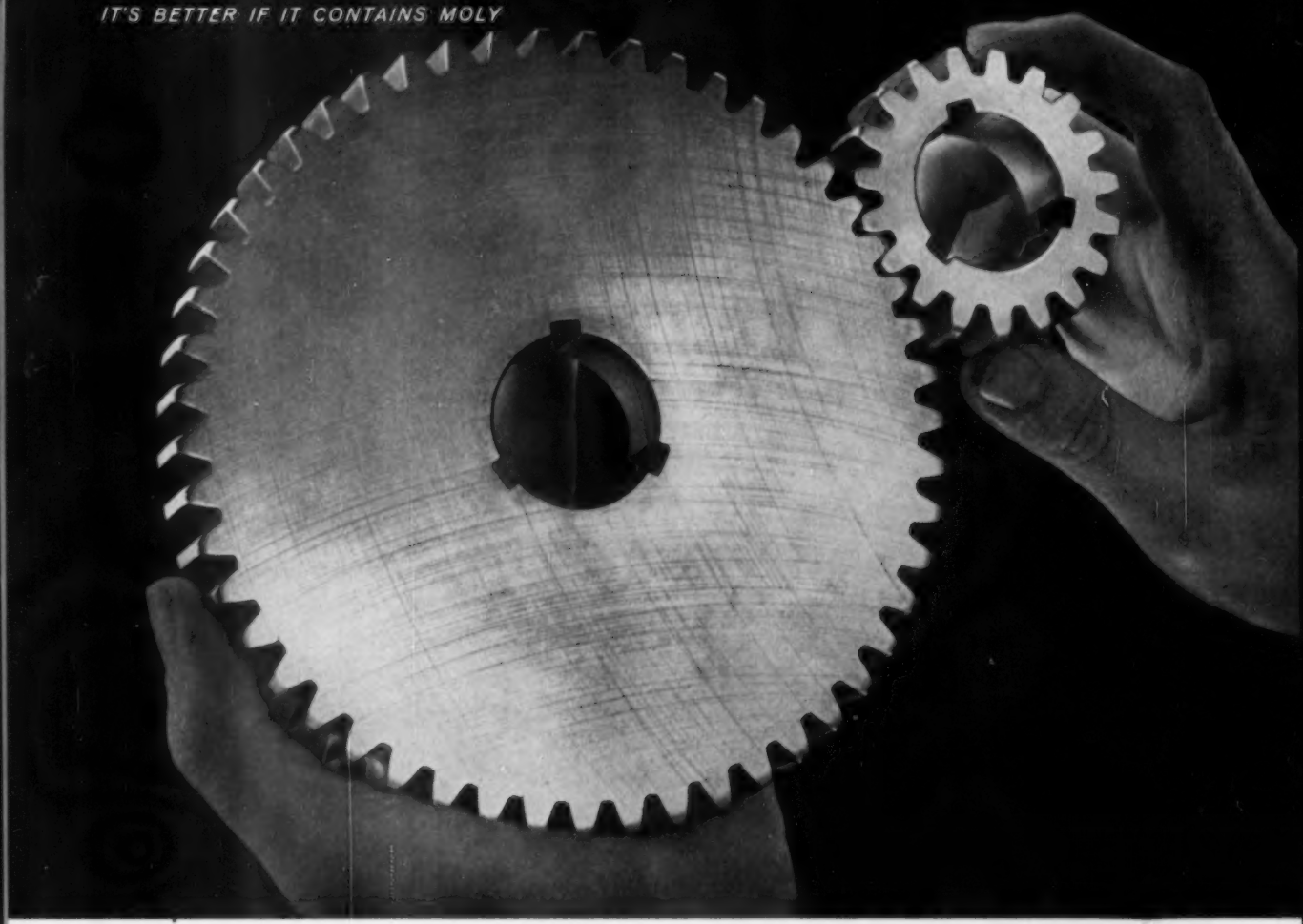

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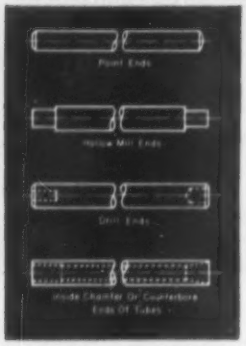

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The Type 5200 Automatic Double End Machine performs operations for which it is suited on diameters of 1/4" through 1-1/2" and lengths 1-1/2" to 30".

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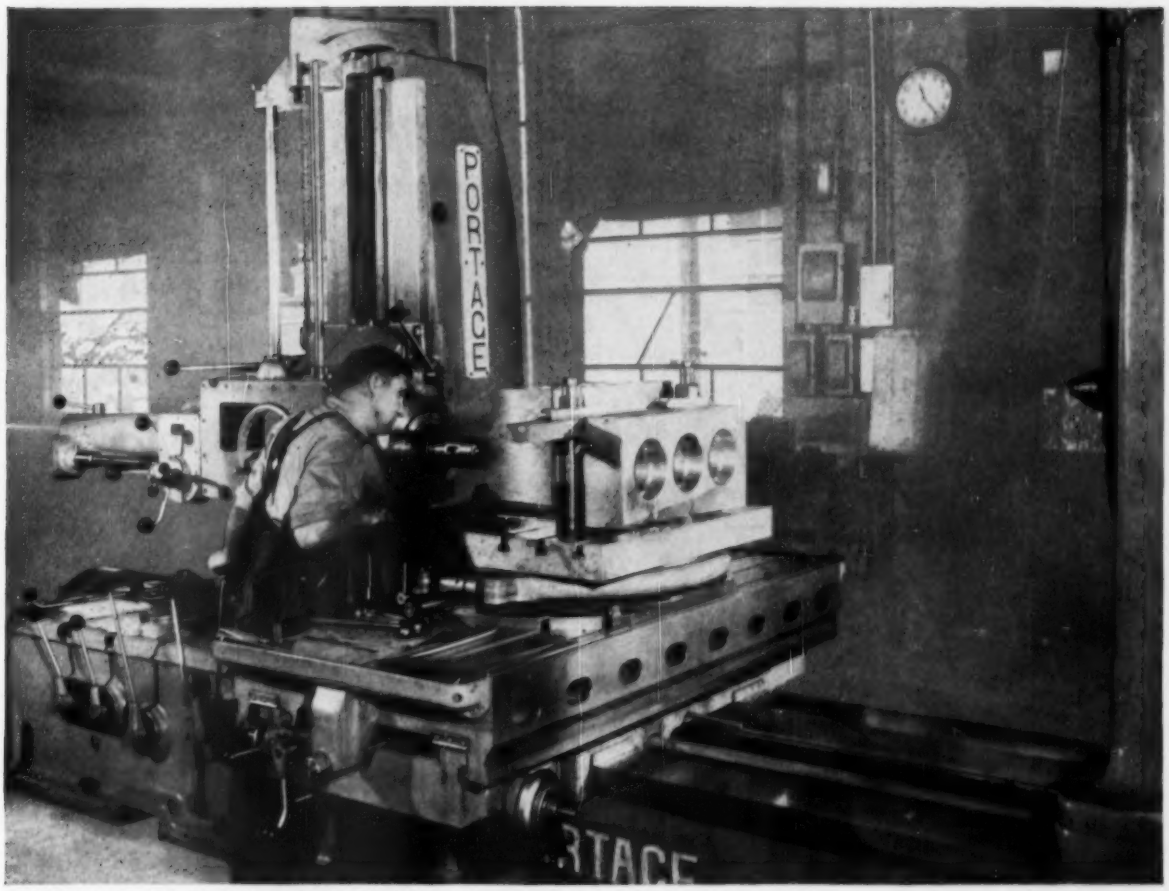

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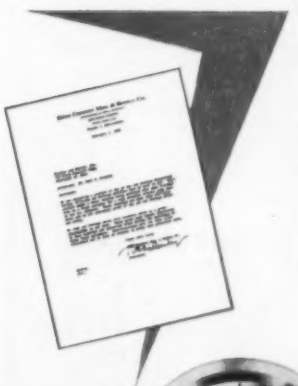

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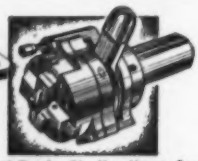

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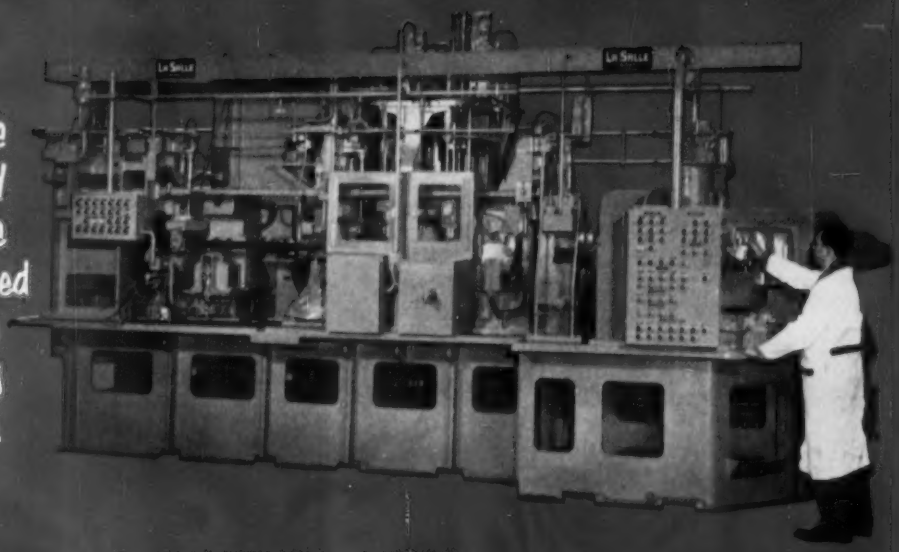
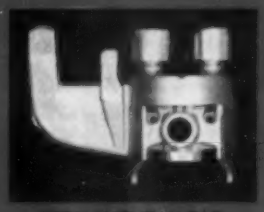
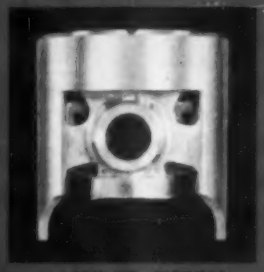




PERMANENT MOLD



MACHINED PISTON

fully automated 14-station unit

The pistons, as they come from the mold, are fed, on conveyor, directly to this new unit. They pass thru 5 stations in the "Dial Type" section, and 9 stations in the "In-Line Type" section of the machine. And, the pistons are never slid, rolled or bumped.

series of operations performed

It mills off the gates and risers; pierces the wrist pin hole, and the window around the wrist pin hole; hollow mills the piston OD; faces the piston head; faces, and chamfers the skirt of the piston; weighs, and gages each piston; and, rejects pistons found to be over size, over weight, under size or under weight.

produces 400 pistons per hour

Furthermore, this unit will handle, any one of 3 different pistons, merely by changing the position of the selector switch, and the fixture locaters.

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The shuttle mechanism can be adjusted for different size and shaped pistons, which automatically allows for future parts design changes.

unitized construction

It's built to J.I.C. Hydraulic and Electrical standards. There's automatic lubrication throughout. And, there is a chip conveyor provided in the base of the unit.

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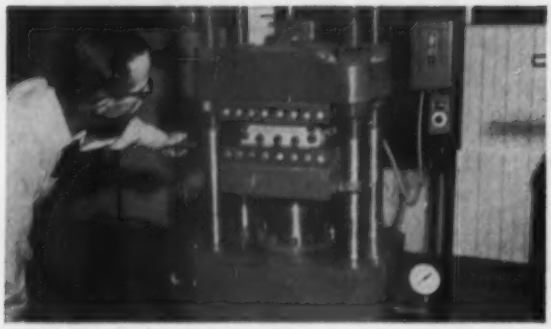
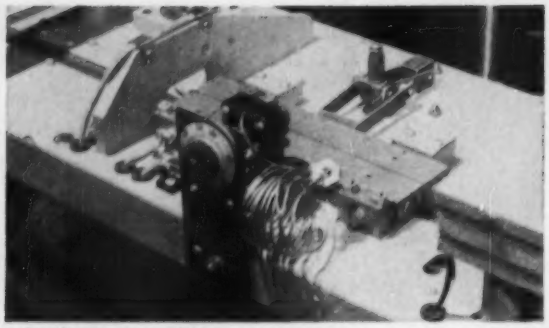
CHROMALOX Electric Cartridge Heaters

. . . compact, self-contained heat for your production equipment

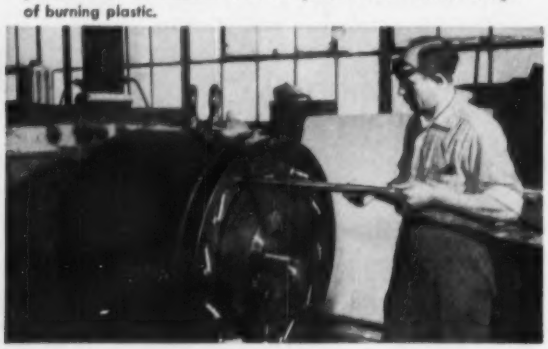


Plastics molding press—Thermostat accurately measures out the exact temperatures needed in one press or a dozen—a different heat for every press if necessary.



Packaging machine—Controlled heat in each of two platens tightly seals food product in plastic bags. Thermostatic control provides 160°F maximum heat for positive seal without danger of burning plastic.

Die-forming—Uniform temperatures of 900°F maintained in both top and bottom halves of die to lessen mechanical stress during forming of camber sheet for aircraft propeller.



Extrusion press—Easily installed heaters keep billets at 1000°F to provide proper flow . . . provide uniform temperature; constant, accurate control; rapid heat-up with minimum radiation loss.

When you install Chromalox Electric Cartridge Heaters, you get the many advantages that only electric heat can provide. Low initial cost; quick and easy installation; long, maintenance-free heater life. Instant heat-up. Accurately maintained temperatures to 1000°F controlled at each machine. No pipes, valves or flues. No flames or fumes. Cool working area.

There is a Chromalox Electric Cartridge Heater for every spot heating job. Lengths to 40 inches; diameters of ¼ inch to 3¼ inches. Ratings from 30 to 8750 watts, with terminal and lead wire styles for every type connection and application.

For the full story, call your Chromalox Representative, or, write today for Bulletin 850.

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Special Protective Features Give You Long Heater Life

FLEXING

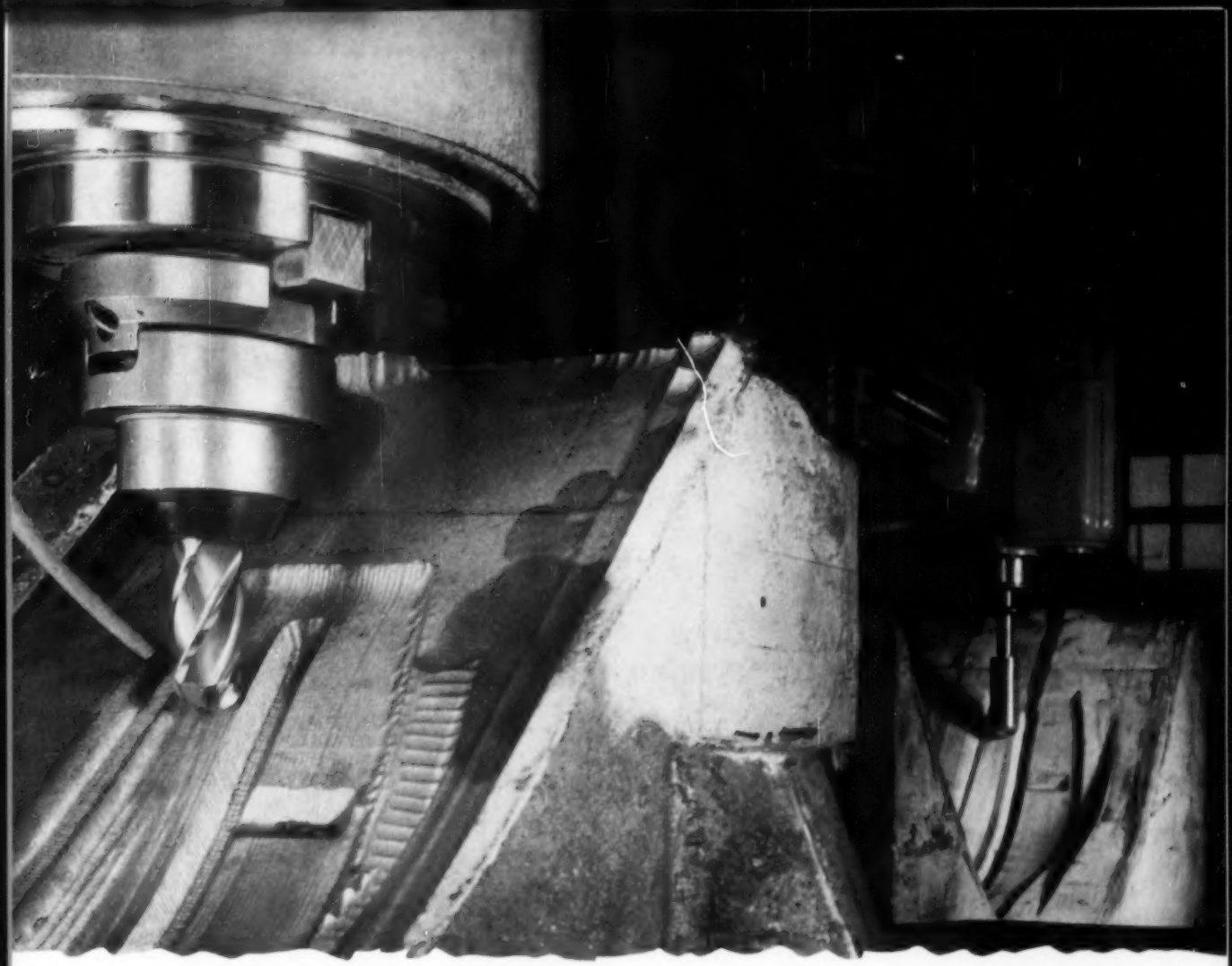
Spring strain reliever for applications in which heater leads flex. High tensile spring, mechanically locked to heater, covers lead wires a distance sufficient to distribute stress.

ABRASION

Flexible brass conduit protects lead wires against abrasion from other moving parts and from accidental mechanical damage. Safety factor where lead wires are exposed to machine operator.

MOISTURE

Moisture-resistant flexible brass conduit protects lead wires of heaters operating in presence of steam, water, oil and vapors. Added protection from flexing, vibration and mechanical damage.



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New CLEVELAND 4-flute center cutting End Mills reduce individual end tooth shock and assure smoother cutting action, particularly in plunge milling.

The advanced design of 4-flute 500 Series High Speed End Mills is your assurance of *accuracy* and *high production* in both tracer and general purpose milling. The accurately form-ground notches and the precision ground cutting edges give you absolute uniformity and *positive chip removal.* ◈ Try these new CLEVELAND End Mills on your next job. Get all the advantages of 4-flute mills *and plunge cutting, too!* Contact our nearest Stockroom, or . . .

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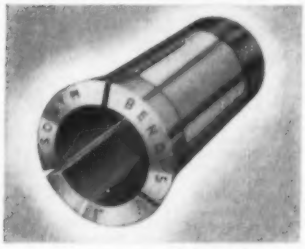

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Step Chuck and Closer

Red Arrow Collets These new precision collets will bring out the best in any lathe. They are manufactured with exacting care by processes that insure extremely accurate concentricity, true centering and long, dependable accuracy. After the closely controlled hardening of the collets the threads are ground from the solid to provide greater strength, trueness and durability. Red Arrow Collets are your best investment for work requiring the maximum accuracy plus longest life.

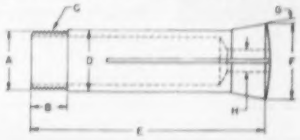
Steel Collets Exceptionally good collets for all general purposes. Comparable to Red Arrow Collets in all ways except that they have milled threads instead of ground threads.

Brass Collets Ideal for less frequently used sizes or for holding soft stock. Manufactured to same tolerances as above collets. Readily machined to hold tapered or irregular shapes—easily rebored to larger sizes when worn.

Step Chucks and Attachments Step chucks for holding large diameter work such as discs, gear blanks, etc., are made in 2" to 6" capacities. Step chuck blanks to 6" capacity can be supplied for machining to fit particular jobs. Handwheel and Handlever Collet Attachments are available.

SPECIFICATIONS OF SOUTH BEND COLLETS

Collets are interchangeable with 2-A, 3-C, 4-C and 5-C. They can be used on many makes of lathes, milling machines, indexing devices and other work holding fixtures.



Collet No.		3	6K	2	4	5
Sizes of Lathes Used On		9"	Light Ten	10"-11⅛" Col. 13"-11⅛" Col.	14½" ¾" Col.	10", 13", 14½", 16", 16-24", 2-H—1" Col.
A. Thread Diameter, in.		.650	.775	.865	.950	1.250
B. Thread Length, in.		¾	2 1/32	1 3/16	1 3/16	¾
C. Threads per in.		26	26	20	20	20
D. Body Diameter, in.		.6495	.8425	.8595	.9495	1.2495
E. Collet Length, in.		2 1/16	3	3 5/16	3	3 5/32
F. Head Diameter, in.		.852	1.160	1.095	1.150	1.452
G. Angle of Head, deg.		12	15	15	10	10
H. Maximum Capacity, in.		½	⅝	1 1/16	¾	1
PRICES OF COLLETS	Red Arrow..	$4.40	$4.55	$4.60	$4.95	$5.50
	Steel.....	4.15	4.30	4.40	4.70	5.25
	Brass.....	1.75	2.10	2.35	2.50	2.90

SIZES: 1/16" up by 1/64" increments. Available in sets by 16ths, 32nds, and 64ths. Collets with decimal and metric hole sizes and with square or hexagonal holes at slightly higher prices.

Builders of lathes, milling machines, shapers, drill presses and pedestal grinders

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These are a few of the features:

- **Rapid Ram Approach** — Automatically changes to power stroke when it contacts the work.
- **Movable Workhead** — Self-contained—easy to center over the work. Workhead can be purchased separately.
- **Variable Ram Speed** — From zero to maximum under fingertip control.
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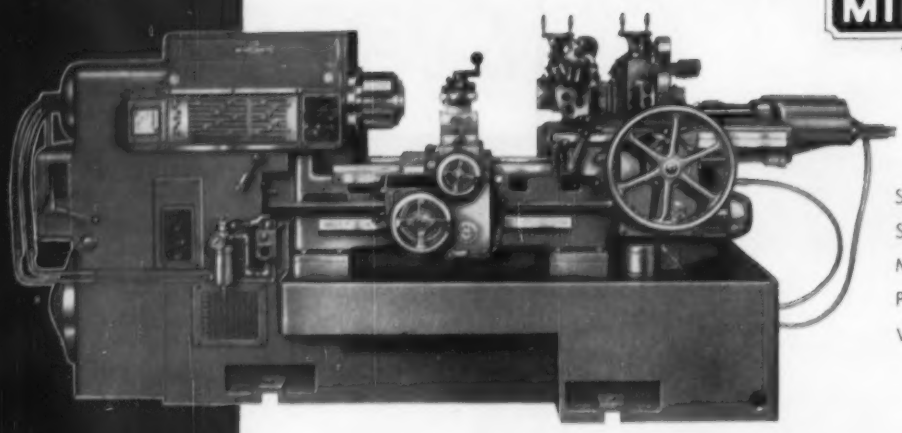

Spindle bore	2 1/4"
Swing	18"
Max speed	rpm 3000
Power	HP 8
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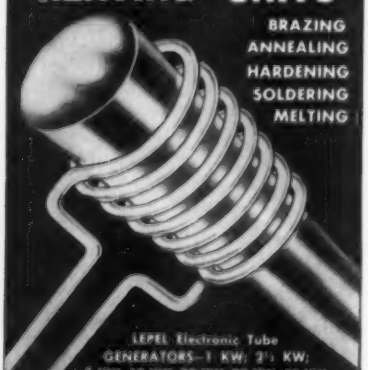

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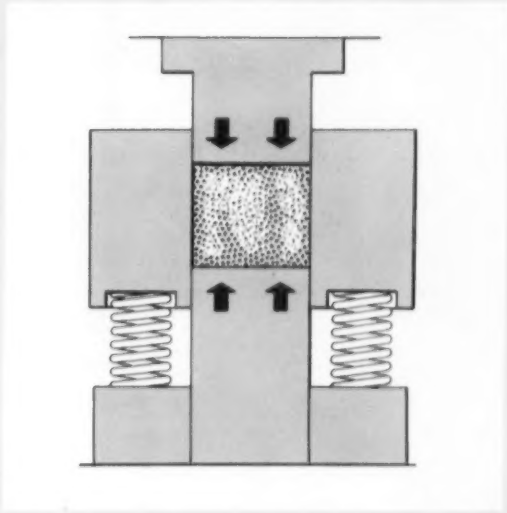


MECHANICAL PRESSING
(Conventional Method)

Milled powder is placed in a latex bag and roughly compacted into a billet. The bag is suspended in liquid in a sealed "pressure bomb." Repeated, enormous surges of pressure compact the powder into a dense, solid billet.

Air is evacuated from the bag before pressing. Residual air works out. No contaminating oxygen remains within the material.

Unit pressures are so high that the resulting billet is strong and hard. It is ready for machining into desired carbide shapes without pre-sintering or further processing.

Pressure is exactly equal in all directions. Pressure surges applied over a long period break down "bridging effects" between particles. Powder compresses to maximum density throughout. The billet is equally strong in all directions; sintering shrinkage is always uniform. Tolerances can be held closely.

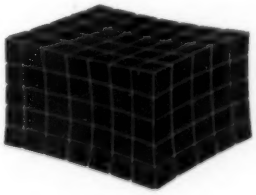
Loose carbide powder is poured into a die in a mechanical or hydraulic press and is squeezed to form a billet. Compacting pressure varies with the surface area of the die and over the billet in areas of unequal fill.

Air entrapped within the loose, fluffy powder remains to cause laminations and other quality-reducing difficulties.

Unit pressures are necessarily low. The billet is weak and crumbles easily. It must be pre-sintered, or half-fired, before it can be handled. The ideal sintering cycle for highest quality can not be used.

No pressure is applied from the sides so the billet is stronger in one direction than another. It is impossible to fill the die cavity evenly and the billet varies in density throughout. Shrinkage in sintering is not uniform; tolerances must be very loose.

A scored billet formed by hydrostatic impacting looks like this after sintering.



A scored billet of mechanically-pressed carbide looks like this after sintering.

***This new method (one of four VALENITE advances) is the key to wider use of money-saving preformed carbides, better all-around performance**

VALENITE METALS CORPORATION

Box 205, Royal Oak, Michigan

See how to cut your carbide costs on following page.

The above preformed tungsten carbide parts (shown unfinished) required little work after sintering.

You can save time and money by using preformed carbide parts*

**. . . Valenite carbide preforms reach you faster —require far less finishing before they go to work!*

Here's Why . . .

1. Methods like Hydrostatic Impacting (see preceding page) enable Valenite to give you closer tolerances. You cut grinding and finishing time and expensive diamond wheel usage

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3. At the new Valenite plant, your preformed carbide parts go into production at once — without red tape delays in the office

4. Valenite maintains a staff of specialists in carbide preforming. Their assistance will save you money, give you improved on-the-job carbide performance

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Write to:
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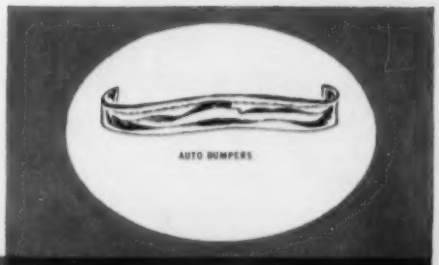
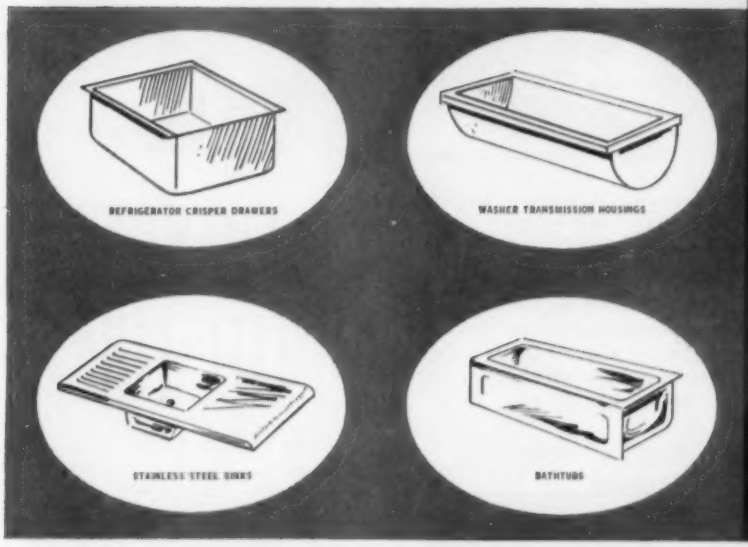
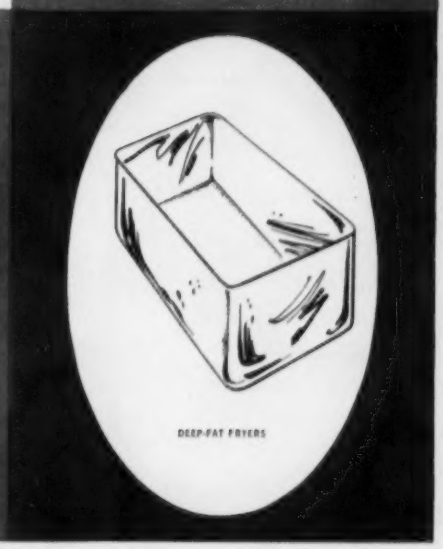
Cut your deep-draw reject rate!

How?

With Pennsalt **DRAWCOTE!**







You can keep deep-drawing dies in top working condition, and cut rejects to a startling degree—simply by using steel bar and sheet stock *pre-coated* with Pennsalt DRAWCOTE. A dry, homogeneous lubricating film applied either alone or in conjunction with other Pennsalt FOS Process chemicals, Drawcote gives even severely-drawn pieces a welcome freedom from scratches and galls . . . protects dies longer than old-fashioned wet lubricants . . . cleans off easily *at any time* before finishing.

There's a Pennsalt FOS lubrication system tailored to improve *your* toughest deep-draw operation—on parts ranging from thin sections to heavy housings . . . aluminum to stainless steel. Whether your job calls for Pennsalt FOSCOAT®, FOSLUBE®, DRAWCOTE®, or any combination of these FOS lubricants, they're applied before the metal comes to the drawing presses —in fact, often by the supplier of metal stock. Parts generally need no recoating between press stages. Call your Pennsalt man for the whole story, or write Metal Processing Dept. 332, Pennsylvania Salt Manufacturing Co. East: Three Penn Center Plaza, Phila. 2, Pa.; West: 2020 Milvia St., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

FOR EXAMPLE:

One manufacturer of deep-fat fryers and other severely-drawn appliance shells tried all the old drawing compounds he could lay his hands on—soaps, oils, waxes—but the shells still came out scratched and needed costly buffing before going to the plating line. Since trying one of the Pennsalt FOS cycles designed for his lubrication problem, he's discarded the wet, messy, unpredictable drawing compounds of the past . . . started turning out scratch-free parts . . . has lowered costs in dies, raw materials, finishing . . . made his shop a cleaner, happier place to work in.

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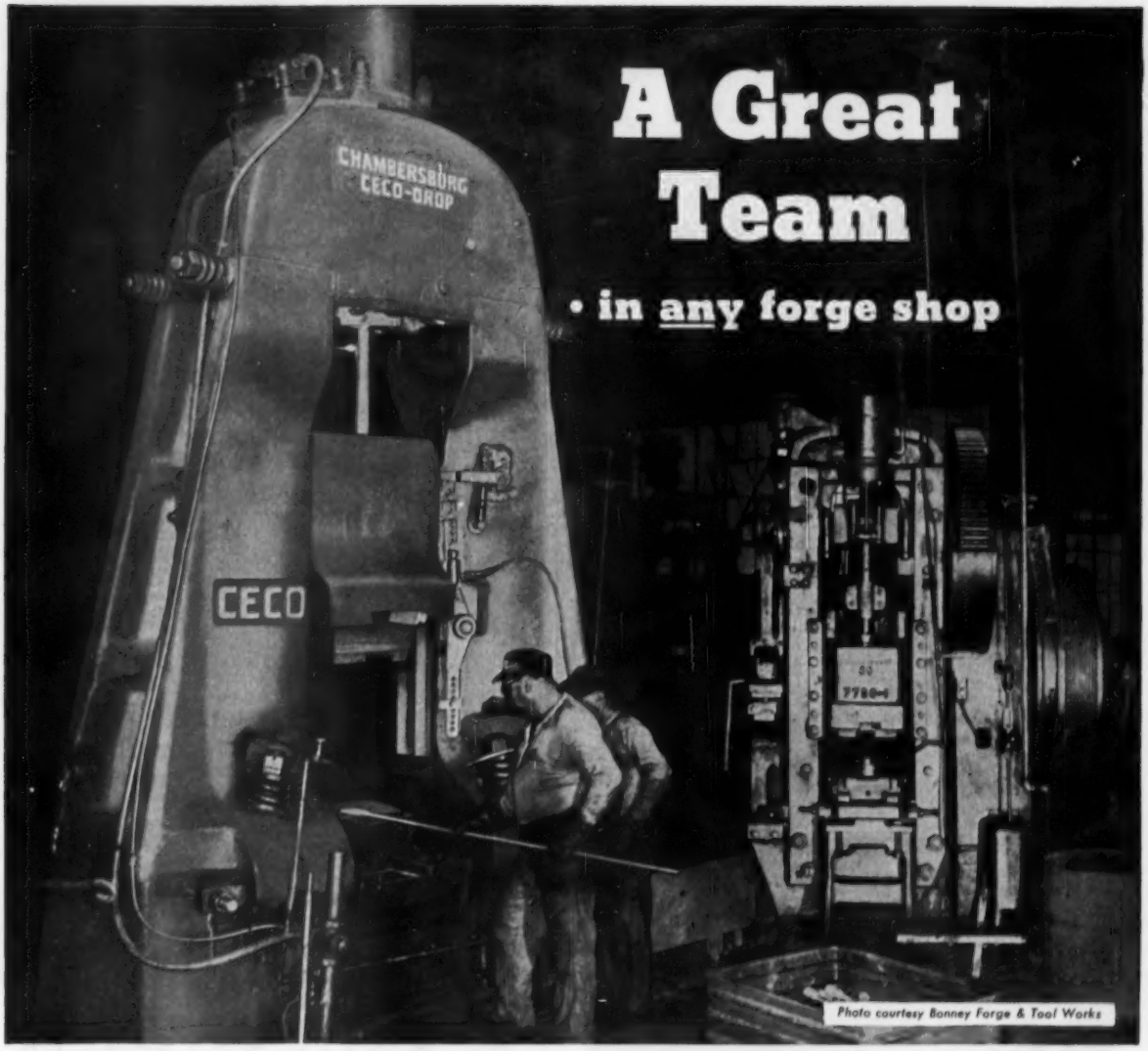
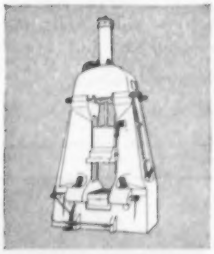


A Great Team

• in any forge shop

Photo courtesy Bonney Forge & Tool Works



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When the chips are down, it is continuous, trouble-free, quality production that puts you ahead of competition. That fact explains why the Ceco-Drop (in combination with the "indestructible" Chambersburg Trimmer) has become in nine short years, the standard gravity drop hammer of the forging industry.

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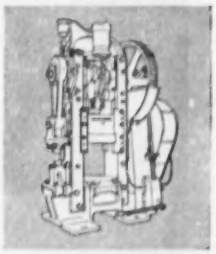

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- Interlocking forged steel side construction
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Modernair

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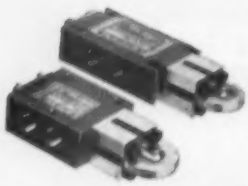

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production problems? *better check . . .*

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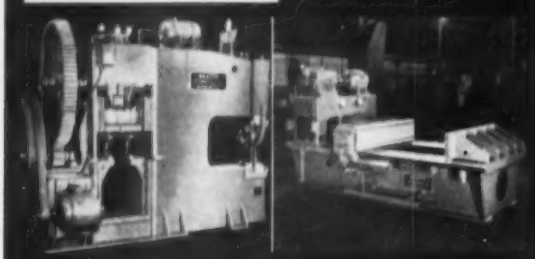

DETAIL BEAM PUNCH (left) — Punches I-beams in just 3 passes instead of the usual 5; eliminates end-for-end turning of beams. Speeds single-hole web and flange punching. 100-ton cap.; 1¼" hole through 1" material. **HORIZONTAL HYDRAULIC BULL-DOZER** (right) — For forming, bending, straightening — rapid production and return speeds boost output: advance — 262" per min.; press — 29" per min.; return — 385" per min.

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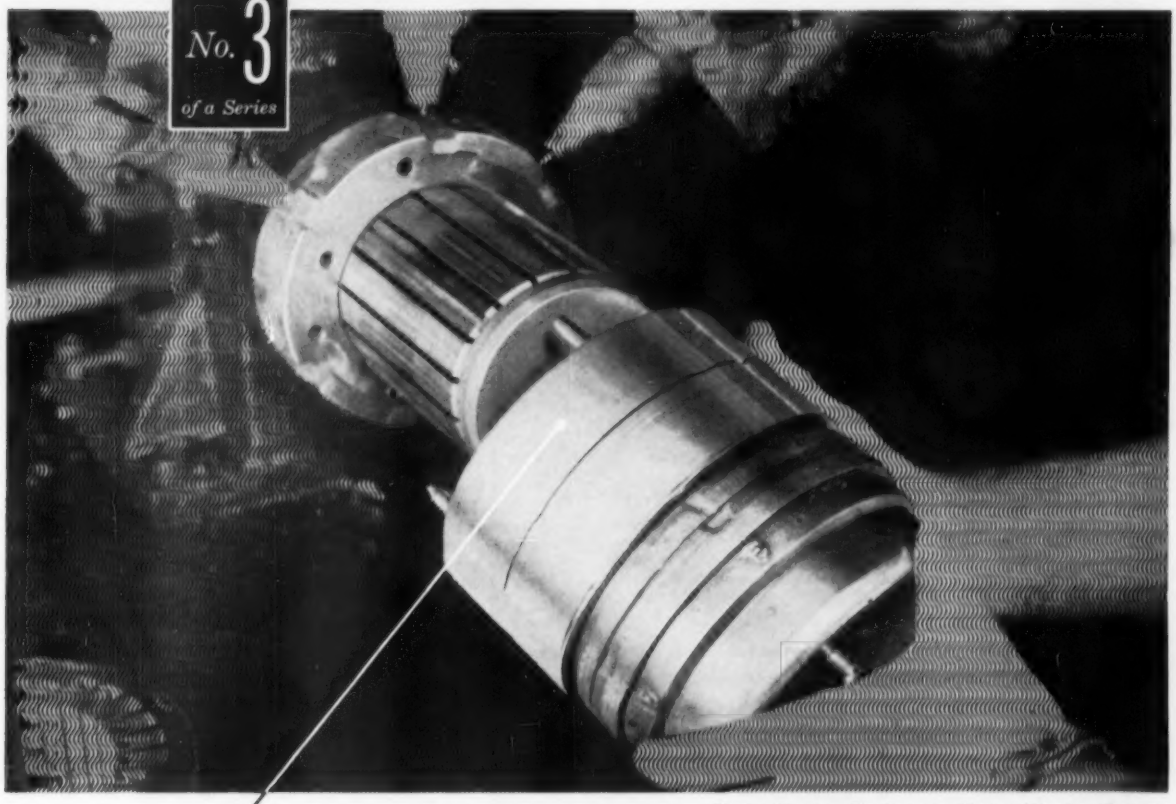
No. 3 of a Series



Photos: Courtesy The Emerson Electric Mfg. Co., St. Louis

e.g. electric motor stators

Emerson Electric, big-name electrical manufacturer, assembles stator laminations the modern way—with Erickson Mandrels. Gone are the old-fashioned arbor assembly methods that require a large tolerance between laminations and arbor . . . that lead to eccentricity of stator bore and to additional finishing operations on the OD.

Emerson Electric works "from the inside out" with Erickson Precision Expanding Mandrels. Laminations are placed on a fixture and the fixture slipped over the expanding mandrel. Laminations are then welded together with two passes through a three-torch head.

Result? Stators are concentric within Erickson's guaranteed accuracy of five "tenths." And Emerson Electric gets a better motor with uniform air gap . . . that produces uniform torque and rated horsepower . . . that creates minimum electrical interference . . . and that lasts longer.

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ID of stator assembly (lower left) requires no finishing operation after welding.

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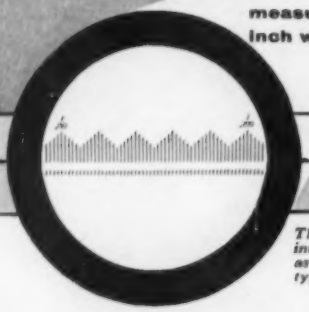

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DW15 Tractor with No. 15 Scraper and D8 Tractor at suburban housing project, Tulsa, Oklahoma.

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The press illustrated at right is one of the new WILLIAMS-WHITE machines installed in the Caterpillar Tractor Co. plant in Decatur, Illinois.

It is essentially a straightening press but the wide table, 90" by 54", makes it a versatile tool for other operations.

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The press above is typical of machines built to specification by WILLIAMS-WHITE & CO. If you have need of such equipment, we will be pleased to receive your inquiry. Our staff of engineers and designers is at your service, without obligation.

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Gaging . . .

the Surplus Machinery Market

The fight for faster writeoffs on used machinery is shaping up fast in Washington, where the Machinery Dealers' National Association has an accounting staff working up a new brief to be presented before the Senate Finance Committee and the House Ways & Means Committee. Right now, the pro-small business climate is favorable and MDNA can expect small business spokesmen and several industry groups to support its stand.

In essence, the presentation before Congress will amplify the arguments made in 1954 before the Senate Finance Committee by then-president of MDNA Richard M Nathans of Kings County Machinery Exchange, Brooklyn.

At that time, Mr Nathans told the Committee that restriction of the then-new accelerated depreciation allowances to industrial equipment built after January 1 1954 "discriminates against a large segment of industry." He said that the new depreciation methods would allow metalworking equipment users to "upgrade" equipment in their plants "much faster than under the present straight-line method of depreciation."

Thus, he added, "Only the established manufacturer who has established credit lines, or is able to finance the purchase of new equipment through the sale of stocks or bonds, will be able to buy the equipment which is expected to accomplish the desired results (of stimulating employment and production in capital goods industries) . . . 96% of American business . . . does not have the financial resources with which to take advantage of this new proposal. There are very few firms, including the very largest, which set up a new plant with brand new machinery and equipment."

Well, that's the gist of MDNA's argument. It'll be backed up with statistics when it goes before Congress. And Washington observers say that now, if ever, is the time to try it.

How goes the nation otherwise? As this is written, the election effects aren't foreseeable. Nor has the Middle Eastern situation had any effect one way or the other. But at least one area felt an October slowdown which dealers attribute to a "wait and see what happens in the elections" attitude.

The tightening money market is still affecting sales adversely. We suggest that you take a look at the Special Report on "Where to Find Money for Metalworking" in this issue. We've tried to take the prospective borrower (the used and new machine tool customer) right down the line on "where to go when you need more dough" for plant and equipment. It may give you some new angles on how to help your customers raise money to buy used machinery —from banks like Chase-Manhattan, down through your local bank, finance companies, factors, the Small Business Administration, state and local emergency aid funds.

In spite of the money squeeze, demand for top-quality used machines is still holding up well by any standards. Trouble is, the A-1 stuff is getting harder and harder to come by.

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AMERICAN 36"x60" High Duty—1940
REED PRENTICE 20"x72" 16-Speed
AMERICAN 12" x 30" High Duty

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B & O #7 2½" Chucking
B & O #2 1" Geared Electric Head
GISHOLT #4 2" Bar & Chuck
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GISHOLT #5 2½" Ram Bar

PRODUCTION MILLERS
CINN. #08 Plain
CINN. #08 Vert.
CINN. #2—18 R & F Cam Roller
CINN. #4-36 Hydromatic, 2-way cycle
K & T 18-54 Simplex

MILLERS
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B & S 3B Hi-Speed Plain
K & T H Plain
K & T 3H Vert.
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VAN NORMAN #22LU Univ.

MISCELLANEOUS
GRAY 36" x 36" x 12' Double Housing Planer—1942
INGERSOLL 42" x 42" x 14' Double Housing Adj. Rail Planer Type Milling Machine, 4 Heads—1940
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No. A-1—6" Arter Surface Grinder
No. 33—12" Heald Rotary, m.d.
No. 25-A—24" Heald Rotary, m.d.
No. 25-A—30" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
Model 64 Bridgeport Face Grinder
#300-66 Hanchett Vertical Spindle, m.d.
78" Type NT Rogers Knife Grinder, m.d.
10"x24"x120" Mattison, m.d.
Model T Builders Iron Foundry, m.d.
No. 90666 Hanchett Hydraulic Face, m.d.

PLAIN CYLINDRICAL GRINDERS

No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1943
6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
10x18" Cincinnati Plain Hydraulic, Model ER, m.d., Filmatic Spindle, 1943
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16x72" centers Type C Norton Semi-Auto., Hydraulic
18"x96" Cincinnati Plain Cylindrical, m.d.
18" raised to 20" size x 72" centers Norton, Type C, m.d.
18"x72" Norton Type C, mechanical m.d.
20"x120" Landis Plain Self-Contained, m.d.

UNIVERSAL GRINDERS

No. 2 Brown & Sharpe, 14"x30" centers cap., m.d.
No. 3 Brown & Sharpe, 14"x30" centers cap., m.d.
10x24" Landis Type C, m.d.
12x49" Norton Universal, m.d., latest
14x48" Landis Universal
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H1 Micromatic Horizontal Hydrohoner, m.d.
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No. 6 Barnes Twin Spindle
No. 306H Barnes Single Spindle
No. 224B Barnes Honing Machine, m.d.

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INTERNAL GRINDERS

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No. 5 Bryant, m.d., latest
Model 5Y Bryant, m.d.
No. 10—10" Bryant, m.d., hydraulic Hole Grinder
No. 10CH16 Bryant, m.d., latest
No. 10—22" Bryant, m.d., latest
No. 16—36" Bryant, m.d., latest
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No. 16-A—28" Bryant, m.d.
No. 24-36 Bryant Hole & Face Type, m.d., late
No. 24P—29" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24-L-36 Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 44 Heald Facing Type Sizematic, m.d.
No. 47A Heald Sizematic, m.d.
No. 640—16" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70 Heald, motorized 3 motors
No. 70A Heald, m.d., latest
No. 72A Heald Sizematic, "Duplex", m.d.
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No. 72AS Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Plain, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 74 Heald, Plain Long Bore, m.d., 1941
No. 75A Heald, m.d., latest
No. 78 Heald Centerless Cylinder Grinder, m.d.
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#40 Heald Horomatic, new 1944
2½" Bar Cline Gilbert Plano Type
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DRILLS

1 spdl. 14" sw, #3 Arby, new 1945
1 spdl. 30" sw, #2LM8 L-G, 1945
1 spdl. 24" sw, #3 Arby Assy, new 1943
1 spdl. 30" sw, #1M8 L-G Hydraulic
2 spdl. 24" sw, #3 Arby Ad. MD
2 spdl. 30" sw, #2LM8 L-G, 1942
3 spdl. 24" sw, #2M8 L-G, new 1943
6 spdl 30" sw, #1LM8 L-G, new 1943
#314 A Baker Unit HD 1943
16 spdl. Vss #Kwik #2 taper, 1944

GRINDERS

8"x12" #3 Reid, 1942
3"x18" #6 Reid, 1943
4"x12" #40 Landis, New 1942
6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1943
10"x30" Norton Type C, new 1943
10"x60" Norton Type C, new 1943
10" x 28" sw x 18" Cline KH 1943
10"x30" Hill Clarke, Ad Mod Dr.
10"x72" Hill Clarke Ad Mod Dr.
10"x96" Hill Clarke Ad Mod Dr.
10" 20"x36" Norton Angular wheel
14"x72" Norton Type C, new 1941
14"x96" Hill-Clarke, A.C. Mot. Dr.
16" 16"x96" Norton Gap, 1942
16"x72" Hill-Clarke, A.C. Mot. Dr.
18" 28"x72" Norton, AC MD 1941
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30" 32"x144" Norton Pl Cyl
48"x72" Norton extras, new 1947
#8A Bryant Internal, new 1943
#16A 16 Bryant Internal, new 1943
#16 3M Bryant Internal, new 1941
#24-16 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A3 Heald Int Sizematic, 1944
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Reeds Double End Duter 1940
RH Abrasive Surf. 6"x24" 1943
#18-30" Blanchard Rot. Surf.

LATHES

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13"x30" Hendey Lathe Taper Att.
12"x36" Lipe Turret Semi-Auto
13"x32" Fay Automatic
12"x45" Fay Automatic
14"x30" Amer Gen Hd., MD
27"x84" Amer Gen Hd. MD
24"x72" Fay Auto At MD
30"x120" Putnam Gen Hd. MD
R14 Sidney Falls 16"x30" 1942
13"x96" or A & P, see 3380
#3W Cline Acme Unit. Turret
#4 Gisholt Unit. Tur. A.C.&B.P.
#3H-16 Libby H.D. Tur 1942
#4A W&S Turret
4FU Fastermatic, tur, 32" sw, 1944
8D Potter & Johnston, new 1941

MILLERS

54"x36"x18 Ingersoll Slab, 1934
54"x60"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rotary
#0V Davis & Thompson Vert., 1944
#12-H Pratt & Whitney Profilers
16"x60" D&W Mod H Thread Mill
#1T 6"x72" L-H Thread Mill
#4T L-H Thread Mill new 1942
No. 2 Cline Unit HI Power
#11d Van Norman Prod. 1942

PLANERS

36"x36"x12' Rockford Openside '42
60"x16"x27' American, 4 hds.
60"x48"x36' Hamilton, 4 heads

MISCELLANEOUS

6" Goss & DeLeeuw 4 spdls 1941
#30d Barnes Vert Hone, new 1942
#11HH 2 Hd W&S Tapper, latest
#36MM 46K 9 Spdl Bevel Gear
612 A Pellows Gr Stepper 16" cam
#11HN Harter Colman Sharp Mach
15 Ton Toledo Overhd. Crane, 5x½

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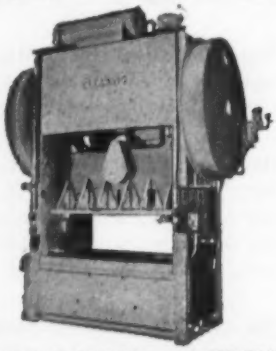

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#35L Excello Thread Grinder #1383
#20A Excello Internal and External Thread Grinder #9185
Sundstrand Plain Duplex Milling Machine, Model #30FM1B120, Ser. #96-265 (10 ft. table). Write

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DEFIANCE Model 25A, 3½ Bar Table Type; late
DETRICK & HARVEY No. 0, 4" Bar Floor Type
DETRICK & HARVEY No. 1, 4" Bar Floor Type
GIDDINGS & LEWIS #340T, 4" Bar Table Type; Auto. positioning for Head & Table; New 1955
HEALD #48-A Single End, Single Spindle "Bore-Matic"; late type
HEALD #49 Double End, 4-spindle "Bore-Matic"
HEALD #49 Single End Univ. "Bore-Matic"; late
LANDIS #35 Floor Type 3½" Bar motor drive
LUCAS #42 4" Bar "Precision" Table Type late type
LUCAS #41 Special Boring Machine; late type
NILES BEMENT POND 3½" Bar, Portable, floor
SELLERS 5" Horizontal Boring Mill, Floor Type; late

BORING MILL VERTICAL

BETTS 98", 2 Swivel Heads, Adj. Rail, M.D.
BULLARD 8" 8 Spindle Type D "Multaumatic" late
BULLARD 16" 8-Spindle Type D "Multaumatic" late
BULLARD 24" Vertical Turret Lathe; late type
BULLARD 36" Vertical Turret Lathe; Spiral Drive, with standard or extra high column; late type
CINCINNATI 42" 2 Swivel Heads; adj. rail; M.D.
KING 36" Heavy Duty; motor drive

GEAR EQUIPMENT—FELLOWS

FELLOWS #13-LS Gear Lapping Machine; late type
FELLOWS Type 6Z2 Gear Shaper High Speed cap. 35" O.D. 3" O.D.
FELLOWS No. 6IA Gear Shaper; late type
FELLOWS No. 612 Gear Shaper; late type
FELLOWS No. 7 High Speed Gear Shaper; cap 7" O.D 5 10" D.P. New 1951
FELLOWS No. 7A High Speed Gear Shaper; late type
FELLOWS No. 75 High Speed Gear Shaper; late type
FELLOWS No. 77 H gh Speed Gear Shaper; late type
FELLOWS No. 715 High Speed Gear Shaper; late
FELLOWS No. 4T Thread Generator cap., 4"x17" centers; late type
FELLOWS #24M Involute Measuring Instrument

GEAR EQUIPMENT—GLEASON

GLEASON #1 Surface Hardener; late type
GLEASON 3" Straight Bevel Gear Generator; late
GLEASON 3" Spiral Bevel Gear Generator; late type
GLEASON #6 Straight Bevel "Revacycle" .450 D.P.
GLEASON #7 Hypoid Cutter Sharpener late type
GLEASON 11 Straight Bevel Gear Generator; M.D.
GLEASON #12 Tool Sharpener; late type
GLEASON 12" Spiral Bevel Cutter Sharpener; M.D.
GLEASON #12 Straight Bevel Gear Roughor; late
GLEASON 12" Straight Bevel Gear Generator; late
GLEASON #14 Hypoid & Spiral Bevel Gear Grinder
GLEASON #16 Hypoid & Spiral Bevel Gear Generator; 2½ D.P late type
GLEASON 12B Straight Bevel "Coniflex Type" Gear Generator late type
GLEASON 15" Spiral Cutter Grinder; M.D.
GLEASON 15" Spiral Bevel Gear Generator; M.D.
GLEASON #15 Generating Press Late type
GLEASON 18" Straight Bevel Gear Generator; M.D.
GLEASON 18" Bevel Gear Testing Machine; M.D.
GLEASON 25" Spiral Bevel Gear Generator; M.D.
GLEASON 24" Straight Bevel Gear Planer; M.D.
GLEASON 24" Straight Bevel Gear Generator; late
GLEASON 37" Spur & Straight Bevel Gear Planer
GLEASON 54" Spur & Straight Bevel Gear Planer

GEAR EQUIPMENT MISCELLANEOUS

BILGRAM 6" Bevel Gear Generator; M.D.
BILGRAM 16" Bevel Gear Generator; M.D.
BROWN & SHARPE #1 Spur Gear Testing Machine late type
BROWN & SHARPE #13 Straight & Bevel Auto. Gear Cutter 18" cap., 4 D.P., M.D.
BROWN & SHARPE #14 Straight & Bevel Auto. Gear Cutter; 34" cap. late type
CINCINNATI #4 Auto. Gear Cutter; cap. 36"; 2½ D.P.; late type
CINCINNATI #6A Auto. Gear Cutter; cap. 72"; 1½ D.P.; late type
CINCINNATI #7A Auto Gear Cutter; cap. 84"; 1½ D.P.; late type
CROSS #1 Gear Tooth Rounding Machine; cap. 4 pitch or finer to 24" dia.; 2 pitch or finer to 6" dia.
CROSS #40 Gear Tooth Pointing & Chamfering Machine; gear face 10", gear dia. 20"
CROSS #45 Gear Chamfering Machine; late type
DETROIT Type GG-3½ Gear Grinder; late type
GOULD & EBERHARDT #36BM; 3-Spindle Gear Roughor 2 D.P.; M.D.
GOULD & EBERHARDT #36BT Gear Roughor 4 D.P.; M.D.
MICHIGAN Model 854 Rack Type Gear Shaver; M.D.
MICHIGAN Model 862-24A Gear Finishing Machine
PRATT & WHITNEY 10" Gear Grinder; single wheel; type; cap. 10-11 16"
PRATT & WHITNEY 20" Universal Hyd. Gear Grinder; single wheel; pitch range 2 to 12; late
ROBEY SMITH #1 Straight Bevel Gear Planing Machine M.D.
SHEFFIELD (Cimatool) #201A Auto. Burring Machine; late type

GRINDERS MISCELLANEOUS

BARBER COLMAN 4-4 HOB Auto. Sharpening Machine New 1954
CINCINNATI #2 Universal Tool & Cutter Grinder
CINCINNATI "MONOSET" Tool & Cutter Grinder —Model 8; late type
EAGER #413 Double End Pedestal Grinder; late type
EXCELLO #46 Carbide Tool Grinder; late type
GALLMEYER & LIVINGSTON Model A-7-T Drill Grinder; late type
GARDNER 24-53" Plain Type Disc. Grinder; M.D.
GARDNER #120A Double End Disc. Grinder; cap. Wheel dia. 20"; late type
HEALD #1 Tool Sharpening Machine; late type
HISEY-WOLF Type 3 Model #1 Slot Grinder; late
INGERSOLL 30" Cutter Grinder; late type
LANDIS 25"x72" Crankpin Grinder; late type
PRATT & WHITNEY Contour Cutter Grinder; late
ROTOREX #1 Universal Tool & Cutter Grinder; late
SELLERS Model 6G Drill Grinder; late type
SELLERS #4T Tool Grinder; late type
K. O. LEE model B-600 Tool & Cutter Grinder

BARBER COLMAN type T Gear Hobber; cap. 12"x12"; 3 DP; late type.

LATHES ENGINE

BRIDGEFORD 42"x50' Centers Geared Head M.D.
DENHAM 18-36"x48" Centers Geared Head, Gap Type
HENDEY 14"x102" Centers "Precision" Toolroom Lathe; late type
HENDEY 14"x30" Centers Yoke Head; M.D.
HENDEY 12"x30" Centers "Precision" Toolroom Lathe; late type
HENDEY 12"x54" Centers Yoke Head; M.D.
HENDEY 16 24"x30" Centers Toolroom Lathe Raised to Send to Swing 26"; late type
HENDEY 16"x72" Centers Yoke Head; M.D.
HENDEY 18"x48" Centers Geared Head; M.D.
LEBLOND 16"x102" Centers Heavy Duty; late type
LEBLOND 18"x72" Centers Heavy Duty; late type
LEBLOND 28"x48" Centers Heavy Duty; late type
LEBLOND 27"x144" Centers Geared Head; M.D.
LODGE & SHIPLEY 12"x30" Centers Toolroom; late
LODGE & SHIPLEY 14"x30" Centers; late type
LODGE & SHIPLEY 16"x30" Centers Cone Head
LODGE & SHIPLEY 18"x14" Centers Model X
LODGE & SHIPLEY 22"x60" Centers Model X
LODGE & SHIPLEY 24"x54" Centers Heavy Duty; Swing over Gap 29" late type
MONARCH 12"x54" Centers Model CKK Precision
MONARCH 18" 26"x72" Centers Model CBB raised in seat to swing 28½"; late type
MONARCH 18"x72" Centers, Model CBB; late type
MONARCH 18"x72" Centers Model CBB WITH KELLER COPYING ATTACHMENT; late type
MONARCH 22"x264" Centers Model M 2 carriages
MONARCH 22"x336" Centers Model M 2 carriages
MONARCH 36"x84" Centers Model "HN" heavy duty late type
NEW HAVEN 42"x120" Geared Head M.D.
NILES BEMENT POND 120"x96" Centers Heavy Duty 2 carriages; M.D.
PRATT & WHITNEY 16"x30" Centers Toolroom Model C; late type
SOUTH BEND 9"x4' Engine Lathe, Model 644A
SPRINGFIELD 14"x63" Centers Geared Head; M.D.
NILES BEMENT POND 36"x100" Centers
WOLCOTT 25"x14' Cone head back geared
WOLCOTT 26"x10' Cone head back geared
ROCKFORD 18"x8' Cone head back geared
LEBLOND 19"x8' Cone head back geared

LATHES MANUFACTURING

BLOUNT 12"x8' Centers Polishing Lathe; late type
BLOUNT 26"x60" Centers Polishing Lathe—Model B3
BLOUNT Model 1B-2 2"x48" Centers Pedestal Mounted Polishing Lathe; late type
GISHOLT #12 Hydraulic Automatic 12" swing; late
H E B 17"x40" Centers High Speed Hyd. Copying Lathe; late type
JONES & LAMSON "FAY" 20"x25" Centers Auto.
LEBLOND Model 7AC Crankshaft Turning; late type
LEBLOND 16"; 16"x30" Centers Automatic Turning
LEBLOND 25"x54" Centers Heavy Duty Rapid Prod.
LEBLOND 42"x20' Bed Single End Boring Lathe
LIPE "CARBO" 12"x18" Centers Production Lathe
LODGE & SHIPLEY #5 x 24" Centers Duomatic Auto; late type
LODGE & SHIPLEY #5 x 90" Centers Duomatic Auto; late type
LO SWING (SENECA FALLS) 4"x60" Automatic
LO SWING (SENECA FALLS) 4"x"4" Automatic
LO SWING (SENECA FALLS) 8"x100" Automatic
MONARCH 14"x42" Centers Model Z Single End Mag. Auto; late type
NILES 30"x25' Bed Boring Lathe; late type
PRATT & WHITNEY 7"x16" Centers Bench Lathe
SUNDSTRAND Model 12"x22" Automatic Chucking
NILES 30"x50' Bed Single End Boring Lathe; late
L & G 33"x10' Double End Crankshaft Polisher

LATHES TURRET

GISHOLT #1L Univ. Saddle Type; Swing 19"; late
GISHOLT #2L Saddle Type Swing 22½"; late type
GISHOLT #3 Univ. Ram Type; Swing 18½"; late
GISHOLT #5 Univ. Ram Type Preselector Head; Swing 19½"; late type
JONES & LAMSON #3 Univ. Ram Type; Swing 21¼"; late type
LIBBY (INTERNATIONAL) Model 4-12 Saddle Type; Swing 32"; late type
MOREY #2 Ram Type; Swing 14"; late type
MOREY #3 Univ. Ram Type Swing 16½", late type
MOREY #4 Univ. Ram Type; Swing 18½"; late type
WARNER & SWASEY #1 "ELECTRIC"; Swing 11"
WARNER & SWASEY #1A Univ. Saddle Type; Swing 18"; late type
WARNER & SWASEY 2A Univ. Saddle Type; Swing 21¼"; late type
WARNER & SWASEY 3A Univ. Saddle Type; Swing 24½"; late type
WARNER & SWASEY #4 Univ. Ram Type Preselector Head; Swing 18½"; late 2-7/16"; for Bar or Chucking; late type

SCREW MACHINES, AUTO. BAR OR CHUCKING

ACME GRIDLEY Model RB 6 Spindle 2" High Speed New 1951
BROWN & SHARPE No. 00G — Auto. Cap. ⅝" Round; late type
CLEVELAND 3½" Model A Single Spindle Automatic; late type
CLEVELAND 2½" Model A Single Spindle; Automatic; late type
CONOMATIC 1⅛" 8-Spindle Automatic; late type
CONOMATIC 4⅝" 4-Spindle Automatic; late type
NEW BRITAIN GRIDLEY Model 6S—6 Spindle Automatic Chucking; Swing late type
GREENLEE 1⅝" 6-Spindle Automatic; late type
GYROMATIC "TAVANNES" #40 6 Spindle Auto
CONOMATIC 1⅝" 6-Spindle Automatic; late type
CONOMATIC 1⅝" 6-Spindle Automatic; late type
CLEVELAND 1½" Model A; 4-Spindle Automatic
CLEVELAND 2½" Model A, Single Spindle Automatic; late type
GREENLEE 1⅝" 6-Spindle Automatic; late type

MILLERS VERTICAL

BROWN & SHARPE #2 Dial Type; table 10" x 50"; Swivel Head; late type
CINCINNATI #0-B; Table 20" x 6"; late type
CINCINNATI #2M; Table 10½" x 32½"; late type
CINCINNATI #3 Model ER; dial type; Table 62½" x 15½"; late type
CINCINNATI #4 Model ER; dial type; Table 78½" x 16¼"; late type
EPAY 10-R Ram Type; table 9" x 36"; late type
KEARNEY & TRECKER (MILWAUKEE) Model 2KM; table 56" x 12"; late type
KEARNEY & TRECKER (MILWAUKEE) Model 4H Vertical Milling Machine; table 74" x 15½"
KEARNEY & TRECKER (MILWAUKEE) #2H; table 50" x 10"; late type
KEARNEY & TRECKER (MILWAUKEE) #4K; table 82" x 18"; late type
PRATT & WHITNEY #3 Die Sinker, rotary table
REED PRENTICE #5 Bed Type Vertical Miller & Die Sinker; Table 68" x 16"; late type

MILLERS PROFILE AND DUPLICATING MACHINES

CINCINNATI Vertical Hydrotel 29"/60"/60" High Power Auto. Depth Control; table 28" x 143" Longitudinal feed 120"; late type
MOREY (The) 2-Spindle Vertical Profiler & Milling Machine; table 17" x 15"; late type
PRATT & WHITNEY GG "Keller" Auto. Toolroom Machine; table 18" x 18"; horiz. travel of column 12"; Vertical travel head 16"; late type
PRATT & WHITNEY Model BL-2416 "Keller" Auto. Tracer Control; 2-dimensional; table 22" x 42"; late type

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24" x 12' BOYE & EMMES Grd. Head, Timken Bearing, Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

17" x 8' LeBlond Regal Grd. Hd. Lathe, M.D.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 4', 5', 6' CINCINNATI BICKFORD Radial Drills.

6 Spindle No. 2 LMS Leland-Gifford Drill Press. Late Type.

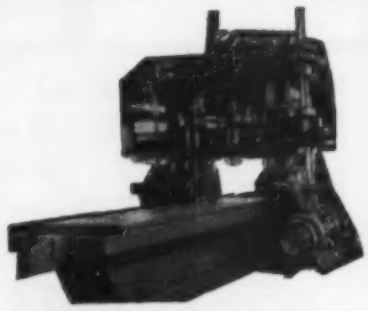
No. 2 M. T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive. Late Type.

MILLS

0-8 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

No. 2HL Kearney & Trecker Horiz. Mill, M.D., Late Type.

1A PRATT & WHITNEY Jig Borer, with Gauges, Rods, Collets and Chuck.



No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

42" by 36" x 12" INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

48" CINCINNATI Duplex Automatic Prod. Mill, M.D.

No. 2, 3, 4, 5 CINCINNATI Hi Power Horiz. Mills, M.D.

PRESSES

A3½ NIAGARA OBI Press, M.D., 56 tons.

No. 7 BLISS Consolidated OBI Press, M.D., 74 tons.

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Driven.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder, Complete Tooling.

4' x 12' LANDIS Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 W HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, M.D. Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine, Detachable Head, Univ. Work Support.

1AA, 3A, 4A, 5½B, 7B ROCHESTER High Speed Rivetting Hammers & Staking Machines.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, M.D. Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine, M.D., 2" Capacity.

8' x 18 Ga. Wysong & Miles Foot Shear, Late

No. 194 BARNES Vertical Hose, 4" Capacity, 12" Stroke, M.D.

12" PRATT & WHITNEY Vertical Shaper, Keller Attachment. Late Type.

15' x 10' x 36' BETTS Double Housing Planer, 4 Swivel Heads, Pendant Control, Box Table, Motor Drives.

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No. 5 Abrasive 12"x60" surface grinder, horiz. spdl.

No. 2 Standard Brown & Sharpe vertical mill, new 1943.

No. 3 Gisholt ram type universal turret lathes (2), new 1942.

No. 5 Gisholt ram type universal turret lathe, new 1940. Arr. bar & chucking.

Models BL2416-BL3616 F & W Keller machines (3) one late

14" x 42" cc Handey toolroom engine lathe, new 1940.

No. 5-48 Cincinnati hydromatic duplex mill, late

No. 4 Cincinnati high-power plain horizontal mill, serial E506J.

No. 4 Gallmeyer & Livingstone universal tool & cutter grinder, new 1941.

5' arm 13" col. Fosdick "Economax" hydraulic radial drill, new 1943.

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CINN 1-18 Prod. Mill 1951
SUNDSTRAND #1 Rigidmill 1956
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 10,000 cy. 1943
WARNER & SWASEY #3 Air Chuck & cyl.
GISHOLT #3, Air Chuck & Cyl. 1943
GISHOLT 1L, bar feed, C.S. turret, 1943
BULLARD 42", VTL Side Head
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl. Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 18x72 Plunge 1948
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads DC drive
SOMMER & ADAMS Thread Mill, 18", H.I.S. 1943
BIGNALL & KEELER 8" pipe threader, 1940
BIGNALL & KEELER 12" pipe threader, 1940
BLISS 312 W, 55SC, 885 Tn, 14" stroke, 48"x30" bed, 1947

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60" x 45' c.c.

Mackintosh-Hemphill new 1943, 62' Bed, Heavy Duty, 2 Motor Driven carriages, geared head, screw-cutting, 60" face plate, 3 steady rests, wt. approx. 160,000#. Additional 25' bed section, will allow 70' between centers.

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No. 16 Blanchard 30" Vert. Rotary
36"x42" Pratt & Whitney Die & Srf.
60" Hanchett Vert. Spin. No. 500
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LATHES, 12" x 96" to 12" x 6'
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Regent Fluid Motion Duplicator Table for Bridgeport Miller

J. G. TILP, INC.
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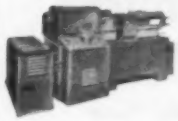
Lipe Hydraulic Carbo-Matic Lathe as illustrated.



Swing over bed ..... 15"

Swing over carriage ..... 8"

Takes between centers ..... 30"

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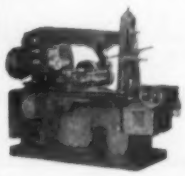

Model A Barber Colman Gear Hobbers, new 1943 and 1944

Maximum diameter gear 12"

Maximum face 12"

Maximum pitch 3

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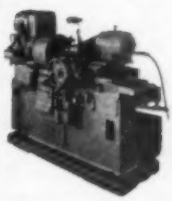

No. 72-A-3 HEALD

Sizematic Hydraulic Semi-Automatic Precision Internal Grinder.

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Tools Machine

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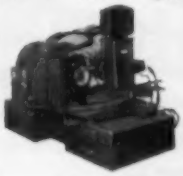

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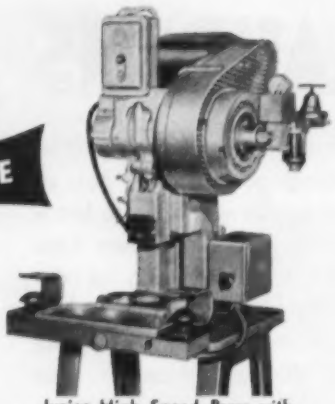

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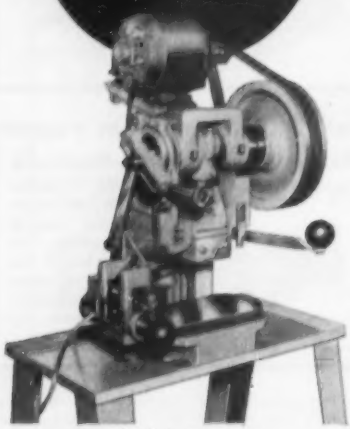

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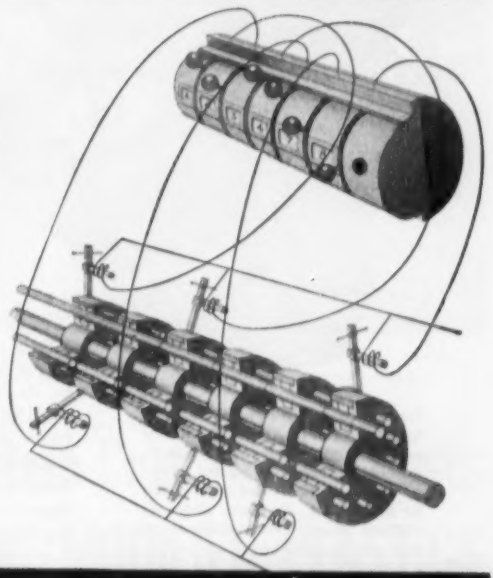

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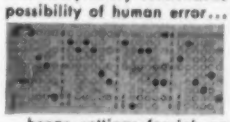

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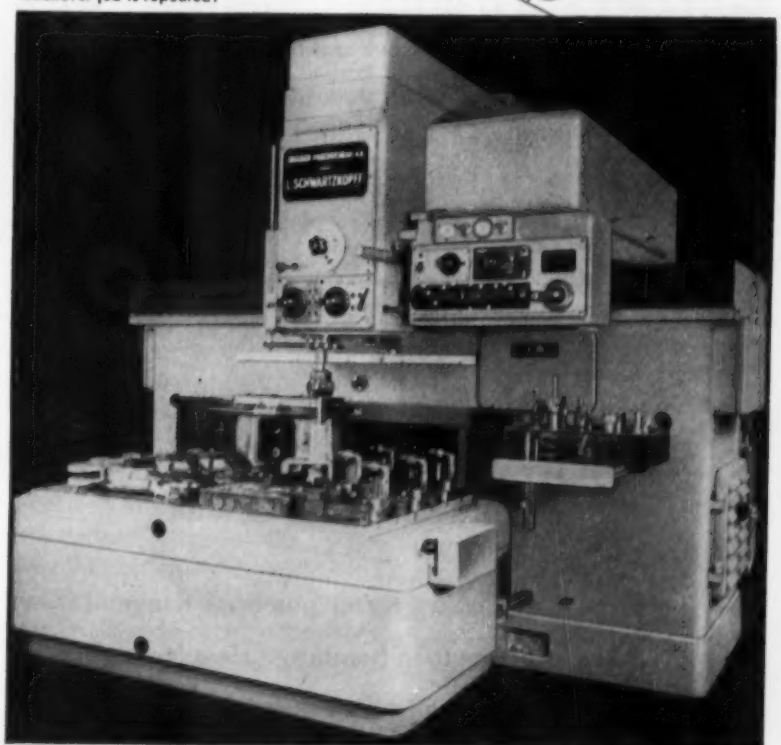

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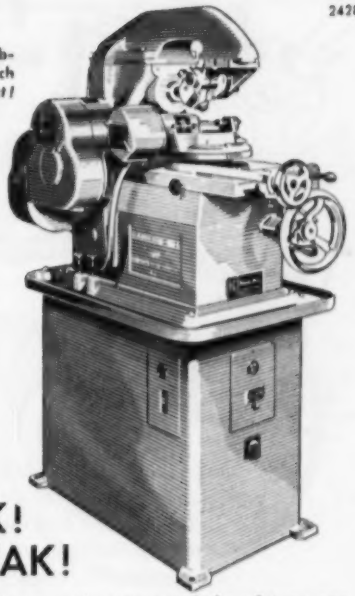

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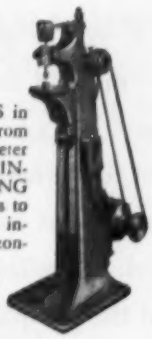

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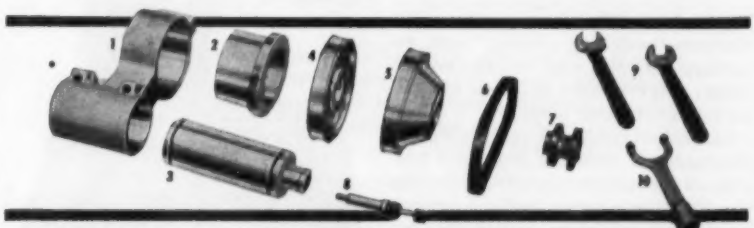

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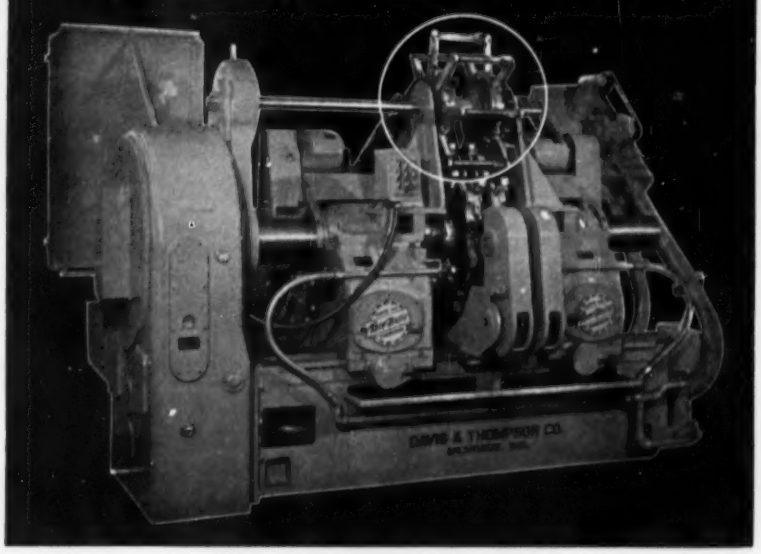

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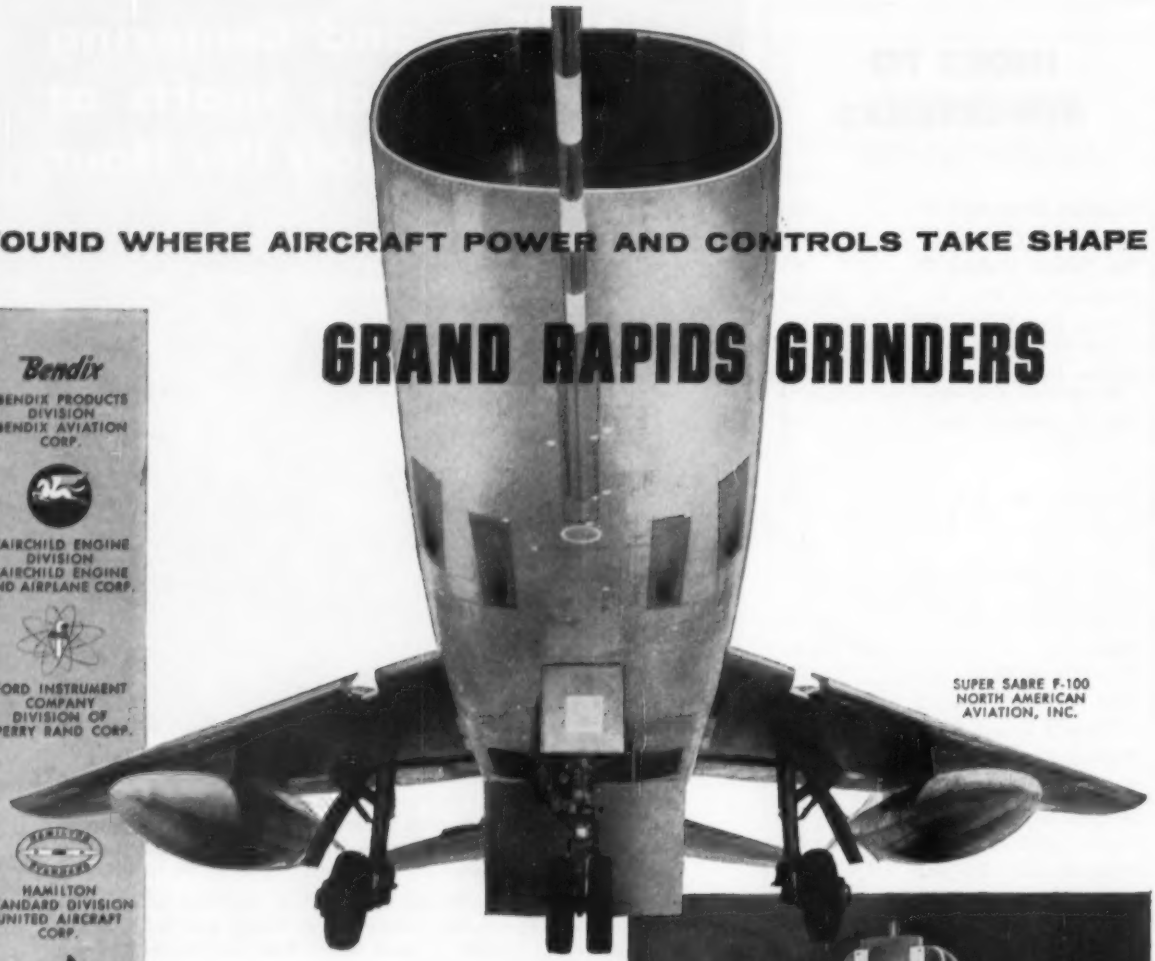

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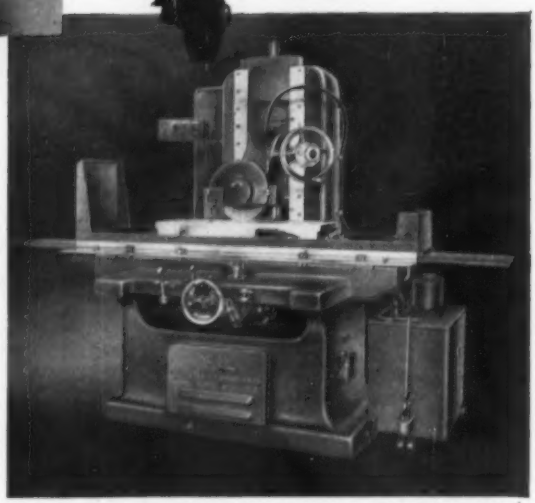

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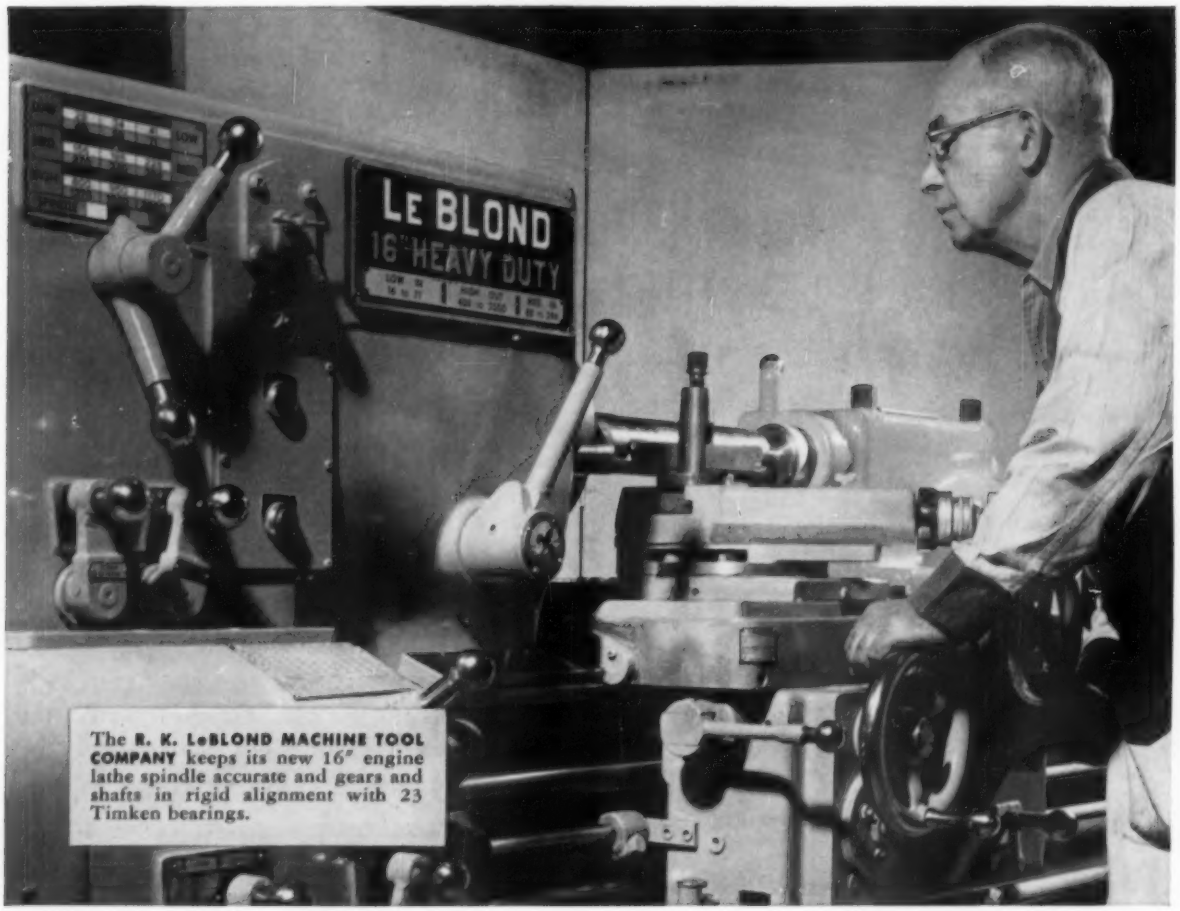

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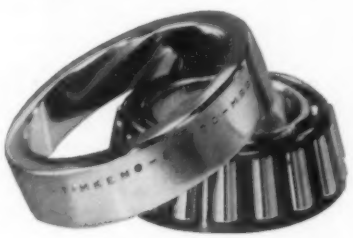

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